FEBRUARY 1, 1945

American Machinist

TECHNOLOGY DEPT.

New Methods Reduce Handwork On Boeing Fortresses

•

Composite Die Sections Save Time

•

Special Tools Machine Spherical Fits On Anti-Aircraft Guns

•

Fixtures Extend Usefulness Of Trays for Pusher Furnaces

War Training Techniques

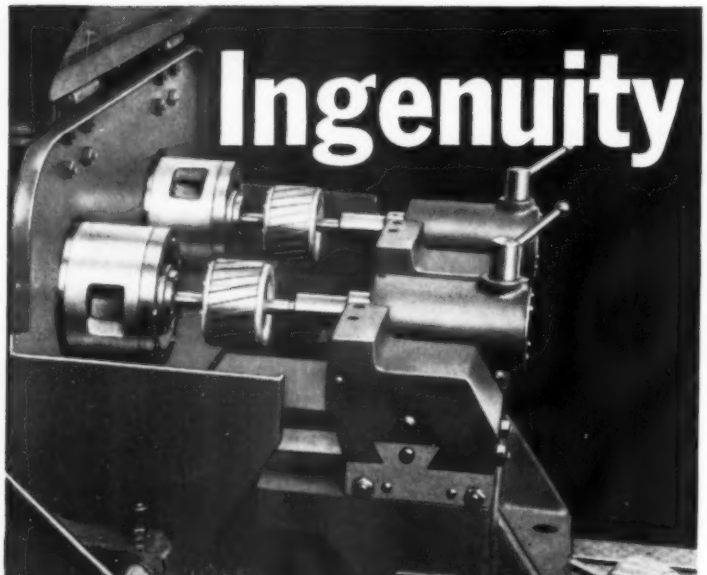
SUGGEST NEW IDEAS FOR INDUSTRY

Ingenuity LIKE THIS IS WINNING THE WAR FOR U. S. . . .

Beer Bottles Instead of Bombs

In the early days of Guadalcanal, Jap warships were sneaking in every night to bombard Henderson Field. We had only a handful of PT's and a dozen scout seaplanes to hold them off. The scout planes couldn't attack with bombs — so the boys worked out a scheme.

Next night, our planes spotted the Nip ships and *attacked with empty beer bottles* — knowing that they would whistle down like bombs. This drew the Jap fire. Revealing gun flashes gave our PT boats a perfect target—and they tore in for the kill.



LIKE THIS WILL WIN THE PEACE FOR YOU

In precision finishing electric motor rotors, grinding proved exceedingly troublesome — wheels would quickly load with soft aluminum. Production was only 70 an hour.

Now — precision-turned two at a time on a Heald No. 49 Bore-Matic specially built for the job — rotors are held to 2.500"— 2.501" O. D. concentric with the shaft within .001" total indicator reading, and parallel to .004" in 12". Production 200 an hour!

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

HEALD

means more precision faster!

INTERNAL AND SURFACE GRINDING MACHINES
BORE-MATIC PRECISION FINISHING MACHINES

TECHNOLOGY DEPT.

American Machinist

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To _____

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Signed _____

American Machinist Chips

In This Issue . . . We think you'll be particularly interested in the following features:

Six-page lead article which explains how the U.S. Army has improved on the best available industrial training methods, with emphasis on visual aids to train millions of men in haste. Military techniques are discussed so that industry can take advantage of these improvements.

Another six-pager telling how new methods have reduced the handwork on the Boeing Flying Fortress. This article points out how welded construction, full-sized hole coordination and machine rivets help speed giant bombers on missions over enemy lines.

No. 1 in a new series of Reference Book Sheets . . . "Simple Indexing of Any Angle." There will be eleven installments.

Silver in the Air . . . It was brought to our attention the other day that B-29's —those over Tokyo and elsewhere—use silver coated bearings in their high compression engines.

Early in the war it was found that the finest bearings then to be had would not stand up under long stretches of terrific speed. A sleeve type bearing was developed composed of steel backing material with a silver bearing surface over which was applied a thin overlay of lead base material. It proved to have great load-carrying capacity and is smaller in size and weight than the standard type.

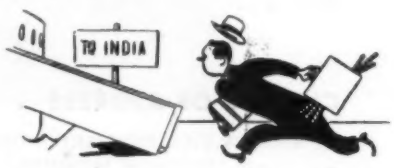
P. R. Mallory & Co. is one of the four bearing companies producing these silver saviors.

The "Flying Forging" . . . An advertisement of Gulf Refining Co. reveals that the Flying Fortress has more than 3200 forged parts—exclusive of ball bearings. Included are forgings of nearly all sizes, types, shapes and metals. Gulf points out, naturally, their engineering service which consults regularly with operating men in leading forging shops to prescribe the right lubricants, cutting and quenching oils for each particular requirement.

Introducing New Products . . . U. S. Department of Census has released, as Economic Series No. 41, a "Check List For the Introduction of New Consumer Products." It is a 44-page booklet which should prove of considerable value to executives planning to enter new fields or introduce new products in present fields.

Hob-Nobbing . . . The house publication of Joshua Hendy Iron Works recently reported a very significant achievement by navy experts in developing a method of cutting big gears faster.

After extensive experiments, they produced a composite hob with a steel body and strips of interchangeable carbide teeth. It sounds simple, but wasn't. Bringing it to Hendy, the navy men had adjustments made in one of the hobbing machines enabling it to be operated at 100 revolutions per minute instead of the usual 35, with the cut starting at the bottom of the gear face. To make a long and what must have been an exciting story short, it worked . . . making the roughing cut much faster than a standard hob of the same design (with steel teeth) would do and producing a smoother and more accurate cut.



Bombay Business . . . From far-off India, we received a letter from Shree Krishna Trading Corp., Ltd., stating that they are immensely interested in the advertising in *American Machinist* . . . as they are desirous of expanding their foreign trade as soon as the war situation permits. The firm are manufacturers' representatives, exporters and importers. They feel it pays to *read* advertising, as well as to advertise. Local metal-working men please copy.

NTDMA News . . . We have been watching with interest the bi-weekly *News Letter* published by National Tool & Die Manufacturers Association since October of last year.

Richard F. Moore, President, reported in a recent issue that the Association now has approximately 230 members and 11 locals or tool centers, as a result of a natural growth over a period of only a little more than a year. He justifiably states that a fine start has been made toward organizing the tool and die industry, but looks for much more effectiveness when the present goal of 500 members and 20 local groups is reached.

All tool and die men who have not yet joined the organization are invited to send for information . . . contacting the membership chairman of a tool center, if near by, or writing the Association's office at the Union Commerce Building, Cleveland 14, Ohio.

Pet Peeve . . . We have long been thinking of starting a one-man crusade against the practice some folks have of failing to *type* their name as part of the signature on a business letter. And invariably it seems that in such cases the writer has a signature that couldn't be read by a Sanskrit expert.

Now, they say that many great people have signatures that can't be read, and we wouldn't quarrel with this as an indication of outstanding character. But it's baffling and often embarrassing to want to reply to a letter and not know whom to address.

This is not academic with us, as we have had occasion to cope with it a number of times over the past few weeks. As a special favor to *"Chips"* and to the entire *American Machinist* staff, we would appreciate your joining this crusade and instructing your secretary to *type* your name as well as having you sign it. Now *that's* off our chest.

BEVEL GEAR DRIVES — TO *Victory*

Bombsights depend on fine-pitch bevel gears like these for their accuracy.

Official U. S. Air Force Photo, *Signal Corps - International*

PRECISION BOMBING BY MECHANICAL BRAINS

Modern U. S. bombsights are responsible for the deadly accuracy of our Air Forces' high altitude bombing which is hastening the day of victory.

Once set exactly on the target by the bombardier, these bombsights perform virtually as a mechanical brain, automatically taking into account all variables and capable of dropping a bomb from 20,000 feet into a "pickle barrel."

BEVEL GEARS CONTRIBUTE REQUIRED ACCURACY

When this mechanical brain is set on the target and takes control of the plane, moments are tense and success of the mission depends upon its perfect functioning. Absolute synchronization and smoothness of motion of all parts is essential. It is here the accuracy of the gears in the mechanism counts.

Super-precision bevel gears, designed by Gleason engineers and manufactured in accordance with improved Gleason production techniques, have successfully met every such action test.

These bevels are cut to extremely fine tolerances for pitch line concentricity and tooth spacing. The method of tooth generation on latest Gleasons gives the accuracy of profile and high degree of surface finish necessary for the smooth operation of the unit.

Quick assembly with zero backlash is possible by virtue of the axial adjustability of bevels. This advantage is of great value, especially in the case of differential applications in the mechanism.

CUT ON GLEASON MACHINES

Mass production of these super-precision bevel gears is accomplished on the Gleason 3" Generators, aided by essential Gleason auxiliaries.

Bevel gears are important parts of many other control instruments for peace as well as war. Gleason engineers will be glad to help you design bevels for these applications and select machines for their manufacture.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

Production is Greater on the Dial Types

Because– operator works where it's most convenient

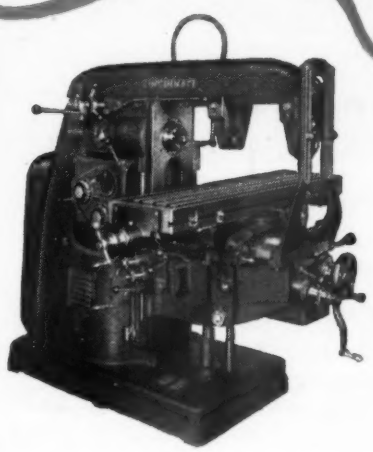
REAR OPERATING CONTROLS. Face-milling ends and sides of an upper station airplane truss. Visibility is practically zero from the front, but perfect from the rear position.

Keep on buying WAR BONDS

THE CINCINNATI

MILLING MACHINES

FRONT OPERATING CONTROLS. Milling slots in a threading die for an automatic screw machine. Operator is working at the front position.



CINCINNATI *No. 3 Plain High Speed Dial Type Milling Machine. Catalog M-970-2 contains complete specifications on the Plain, Universal and Vertical styles, Nos. 2, 3 and 4 sizes, in Medium and High Speed Ranges. Sweet's Catalog File gives a brief description.*

A complete set of single Independent Directional Controls at the *rear* as well as at the *front* of CINCINNATI Horizontal Dial Type Milling Machines, makes it possible for the operator to work in whatever position is the most convenient and where visibility is best. There's a minimum of walking, and more work is accomplished with less effort. Then, too, the operator feels more sure of himself because he can see the cutting action . . . it's safer and there's less cutter breakage. ¶ And complete dual controls is only one of many features of these versatile milling machines. We'll be glad to tell you more about them, and to help you with any milling problems you may have.

CINCINNATI

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S

BROACHING MACHINES • CUTTER SHARPENING MACHINES

This, in brief, is what a manufacturer of precision tools and gauges has to say about *his* Jones & Lamson Optical Comparator. The record speaks for itself, but it is just one of hundreds of instances where the use of these Comparators has resulted in inspection economies, better products and satisfied customers.

Form tools, gauges and other products with complex or multiform contours can be checked and measured in all dimensions with the standard measuring attachments of Jones & Lamson Optical Comparators.

Or, the inspection of large quantities of duplicate parts can be made rapidly and accurately, by comparison with a master outline drawn upon the glass screen, on Comparators designed specifically for this purpose. There is a model for every job, and the results are *beyond a shadow of a doubt.*

For the method best suited to your own needs, consult a Jones & Lamson inspection engineer. There is one near you, and he is backed by an organization with over 20 years experience in the optical inspection field.

"INSPECTS 200% FASTER THAN FORMER METHODS"

"NO CUSTOMER REJECTIONS SINCE INSTALLED"

"CHECKS ACCURATELY IN ALL POSITIONS"

"CHECKS .0002" TOLERANCES ON CONTOUR GAGES"

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.

2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*

3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.

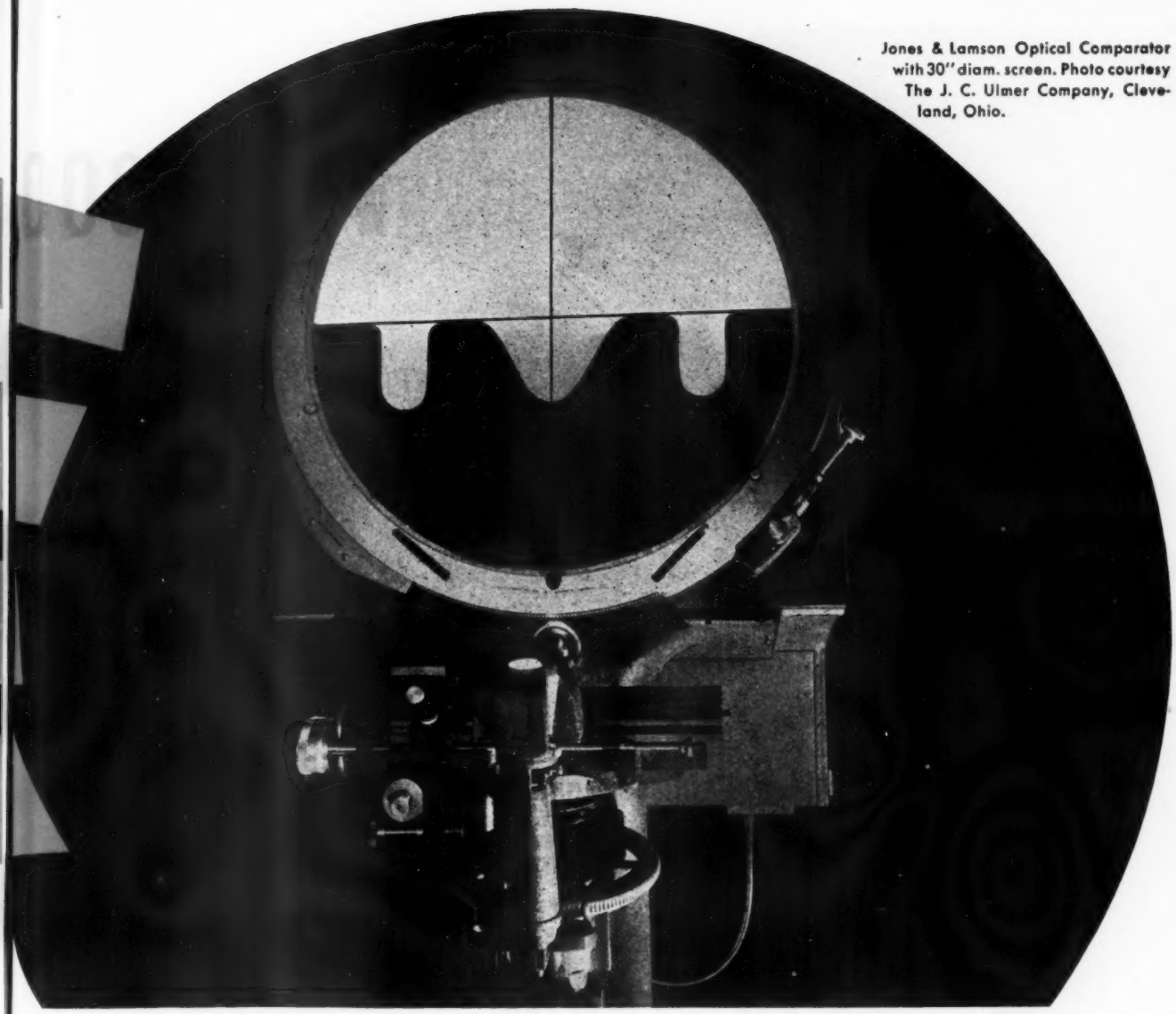
4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.

5. Rigid Machine Construction.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

DID YOU KNOW...

THAT JONES & LAMSON OPTICAL COMPARATORS ARE USED TO INSPECT PRECISION-MADE COMPONENTS OF THE DRY SHAVERS THAT REMOVE YOUR WHISKERS SO SMOOTHLY AND RAPIDLY.



Jones & Lamson Optical Comparator with 30" diam. screen. Photo courtesy The J. C. Ulmer Company, Cleveland, Ohio.

JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS

STANDARD BENCH COMPARATOR

BENCH COMPARATOR 14" DIAM. SCREEN

DIRECT PROJECTION COMPARATOR

STANDARD PEDESTAL COMPARATOR

PEDESTAL COMPARATOR 22" — 30" DIAM. SCREENS

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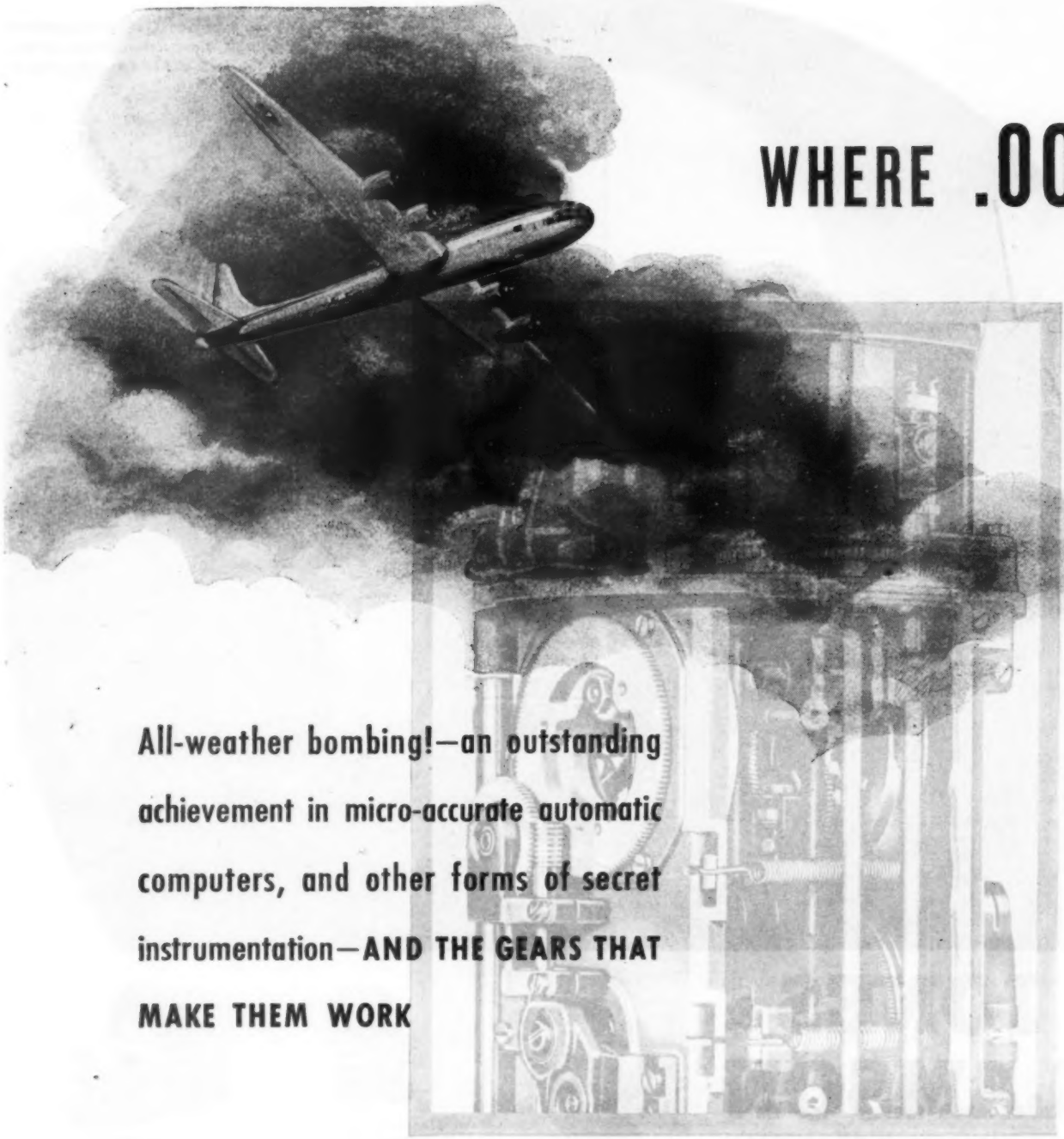
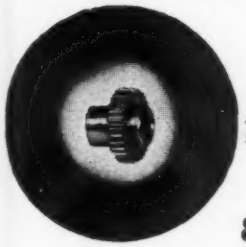


All-weather bombing!—an outstanding achievement in micro-accurate automatic computers, and other forms of secret instrumentation—**AND THE GEARS THAT MAKE THEM WORK**

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

...IN INSTRUMENT GEARS *Pays Off*



ACTUAL SIZE

80-Pitch Shaving—the Finest Yet...easily held to "instrument" tolerances with Fellows Machines and tools

The challenge of making an 80-pitch shaving tool and of controlling gear accuracy to the limits imposed by airplane instrument service has produced interesting results. Not only high accuracy, but high accuracy coupled with high output. The following facts speak for themselves:—

FELLOWS NO. 4 FINE-PITCH GEAR SHAVING MACHINE PERFORMANCE

Gear Part for	*(Military Secret)*
Gear Data	*80 pitch, 30 teeth, 14½° P.A.*
Material	*Aluminum alloy, later anodized*
Preshave limits	*.0006"—.001" max. indicator reading*
After Shaving	*.0002"—.0003" max. indicator reading*
Stock Removed	*.001"—.003" overpins*
Size Control	*.0003" overpins*
Shaving Time	*36 seconds*

Literature on Fellows Shaving Machines is available on the Nos. 4, 8, 12 and 18 inch sizes. Write The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.

Fellows No. 4 Fine-Pitch Gear Shaving Machine which is daily producing extremely accurate gears for airplane instruments.

Fellows

...FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR

THIS 18" MACHINE TAILORED TO GRIND FACE AND HUB WHILE SWINGING 29½" DIAMETER

All the requirements for handling the precision grinding operations on this specialized job were taken care of by modifying a standard CINCINNATI Hydraulic Universal Grinder. The adaptation of this machine to the job is an example of the engineering service offered by Cincinnati Application Engineers. Before you decide on any procedure to handle special jobs, it will be to your advantage to talk it over with our engineers. They will be glad to give you the benefit of many years' experience in modifying and equipping standard machines to handle special operations.

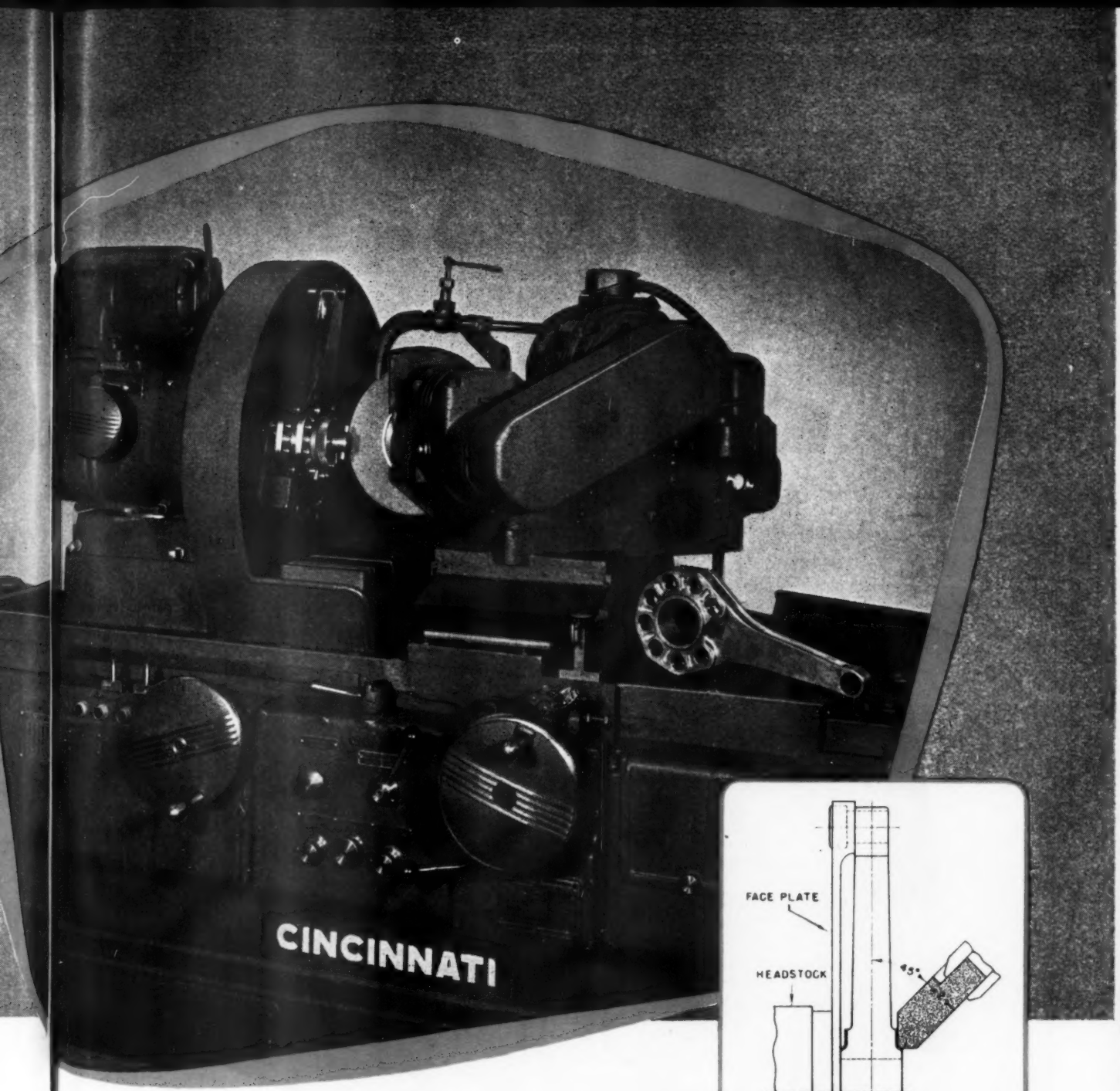
CINCINNATI

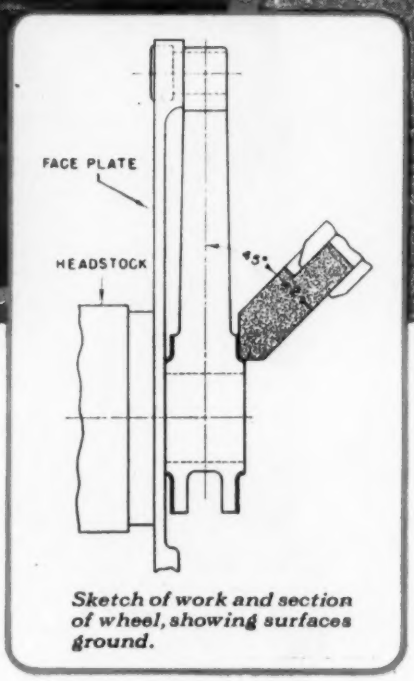
CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings; and 36", 48" and 72" between-center lengths. 12" size is illustrated at the left. Catalog G-486-1 contains specifications on the 12" machine, and G-474-1 for the 14", 16" and 18" grinders. Sweet's Catalog File gives a brief description.

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES





Sketch of work and section of wheel, showing surfaces ground.

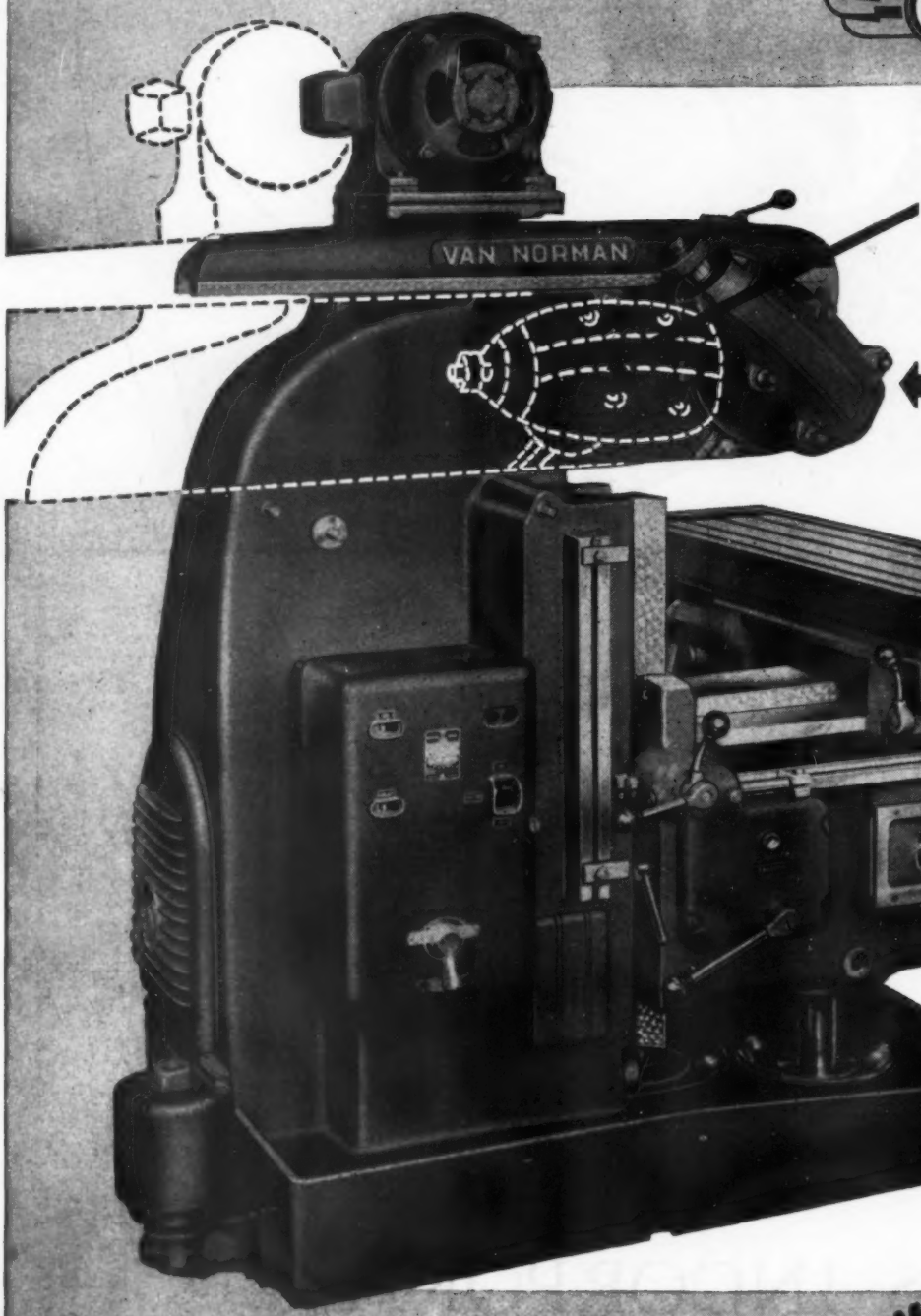
To grind face and hub diameters of aircraft engine master rods, the following special equipment was added to the standard 18" x 36" CINCINNATI Hydraulic Universal Grinder shown above: Raised Headstock; Wheelhead Swivel Plate arranged to bridge table; Multipurpose Sliding Table; Face Plate Fixture; and Table Retraction Controls.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN



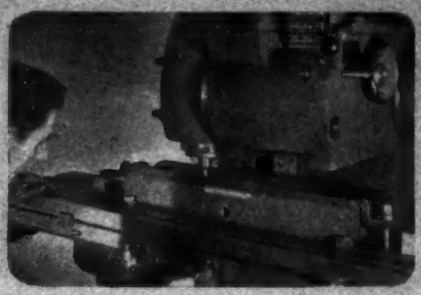
Movable ram, with an in-and-out move over column of 19 inches, provides gre working capacity . . . increases versatilit the machine.

Adjustable cutterhead permits vertical horizontal . . . or angular milling all on machine — gives you the work range several types of millers . . . greatly red work reset-ups.

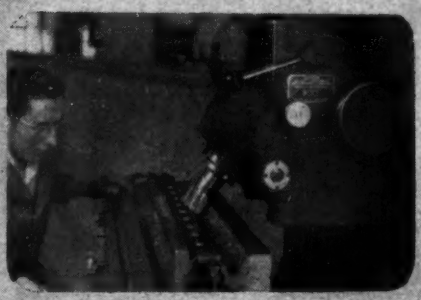
SPECIFICATIONS:
No. 26 Ram Type Universa Miller
Table: 50" x 12"
Range: 28" longitudinal, 12" across, 18" vertical
18 Speeds: 30 to 1500 r.p.
18 Feeds: 3/8" to 32"

"It pays to

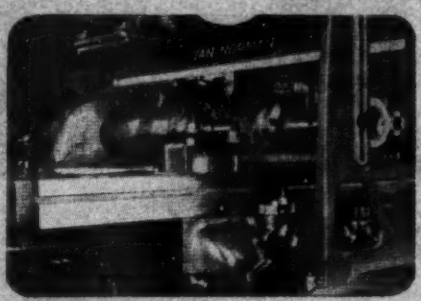
UNIVERSAL
MILLING MACHINES



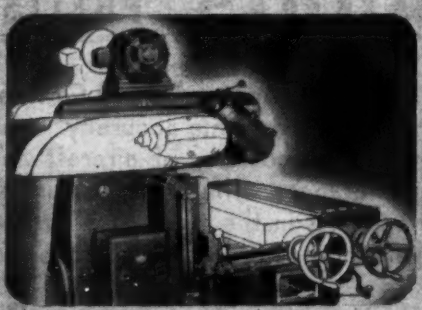
VERTICAL MILLING — In the illustration, the operator is vertical milling a recess in the workpiece.



ANGULAR MILLING — Here, the operator is milling a "V" in the workpiece. Note that the set-up of the work is in the original position.



HORIZONTAL MILLING — With the head locked in the horizontal position, the machine is used for a boring and facing operation.



Adjustable cutterhead and movable ram in combination with the saddle cross feed provides maximum milling capacity and versatility.

Produce More Work with Less Man Hours

Van Norman Ram-Type Universal Millers increase machine and operator output by as much as 40%. How? By reducing idle machine time caused by work reset-ups.

With the Van Norman Universal Milling Machine, the operator changes the position of the cutterhead . . . from horizontal to angular . . . or vertical position . . . instead of the workpiece. The cutterhead is mounted on a movable ram which can be moved in or out permitting the operator to handle all milling operations, whether it be small or large work, with minimum set-ups. The net result is greater machine capacity, faster work with less possibility of errors.

In addition, such Van Norman features as — directional front and rear controls of all power feeds, solid machine rigidity, single selector speed and feed change levers, large easy-to-read dials — all add up to increased output and reduced costs.

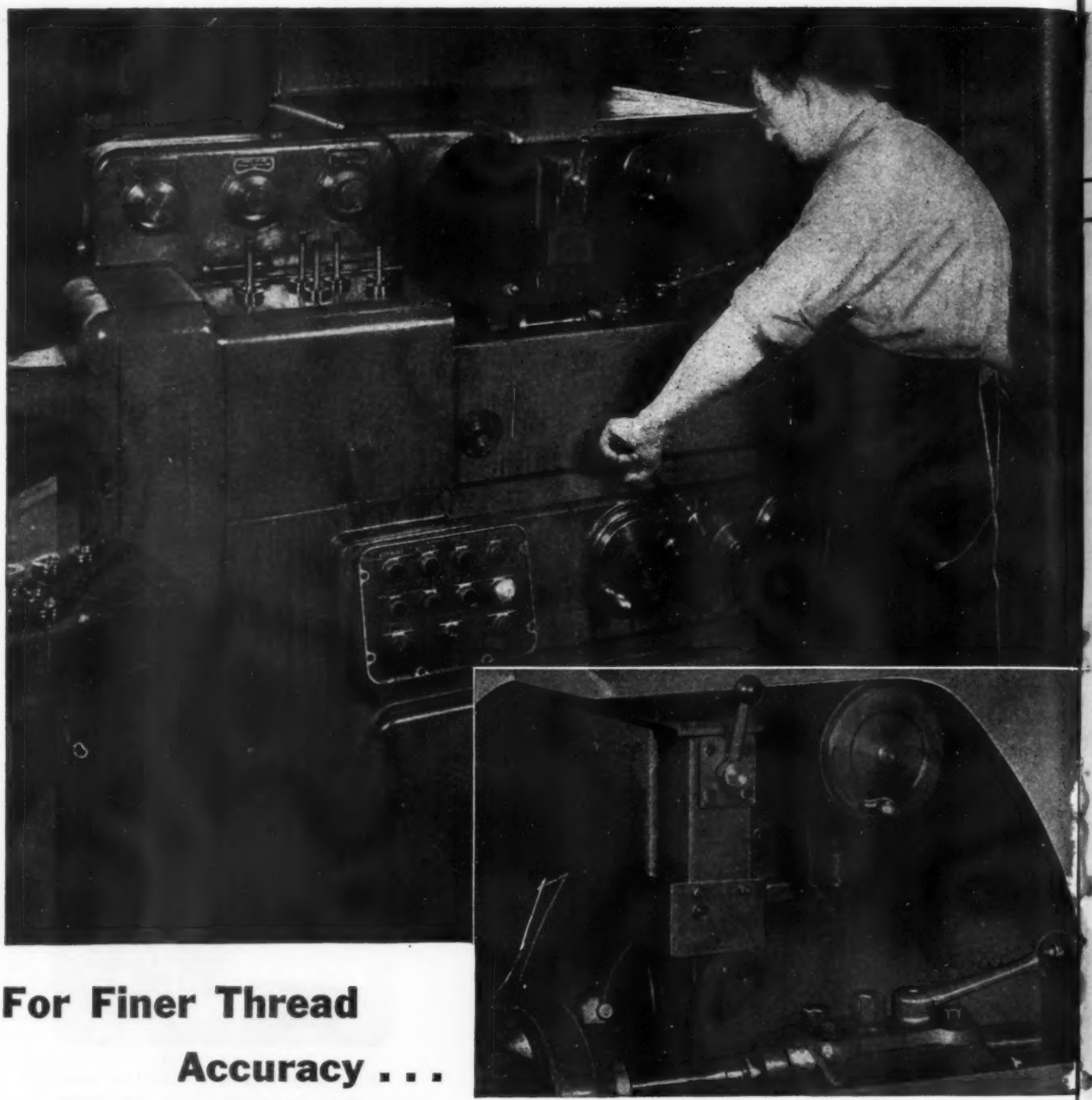
Find out about the Van Norman Ram-Type Universal Millers, today. Write for bulletin.

ARMY E NAVY

VAN NORMAN COMPANY

SPRINGFIELD, MASSACHUSETTS

to Van Normanize



For Finer Thread Accuracy . . .

LANDIS PRECISION THREAD GRINDER

The LANDIS Precision Thread Grinder is a precisely built machine tool, developed especially for grinding threads of extreme accuracy. Many manufacturers depend on their LANDIS Thread Grinder for the finer thread accuracy of aircraft and automotive components that must be produced to extremely close tolerances. The Grinder illustrated is used almost exclusively for grinding Plug Gauges and production parts in the plant of a large manufacturer of aircraft and automotive motor equipment. The finished threads are well within the required specifications for tools of this type.

Write for Bulletin No. E-93

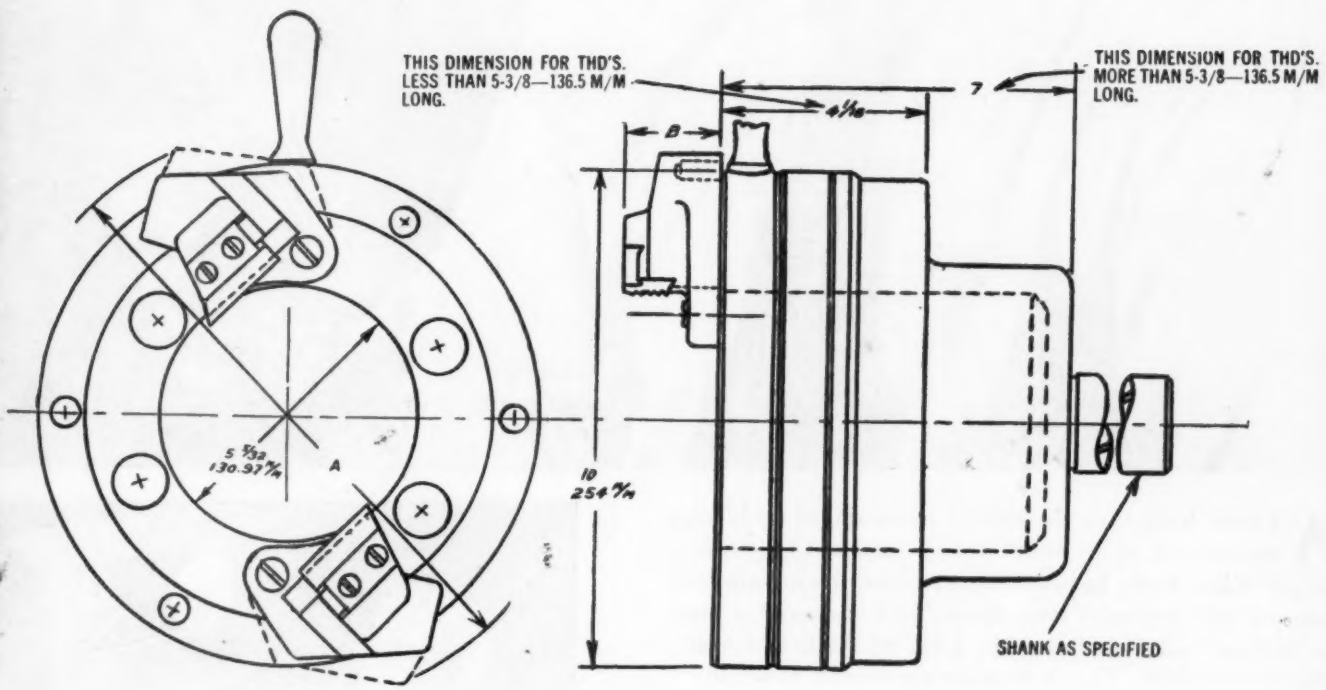
LANDIS MACHINE COMPANY

A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE—MARK PAT. OFF. **THREAD TIPS**

In the Interest of Efficiency, Better Workmanship and Higher Production

SPECIAL 40AX LANDMATIC SIX CHASER DIE HEAD



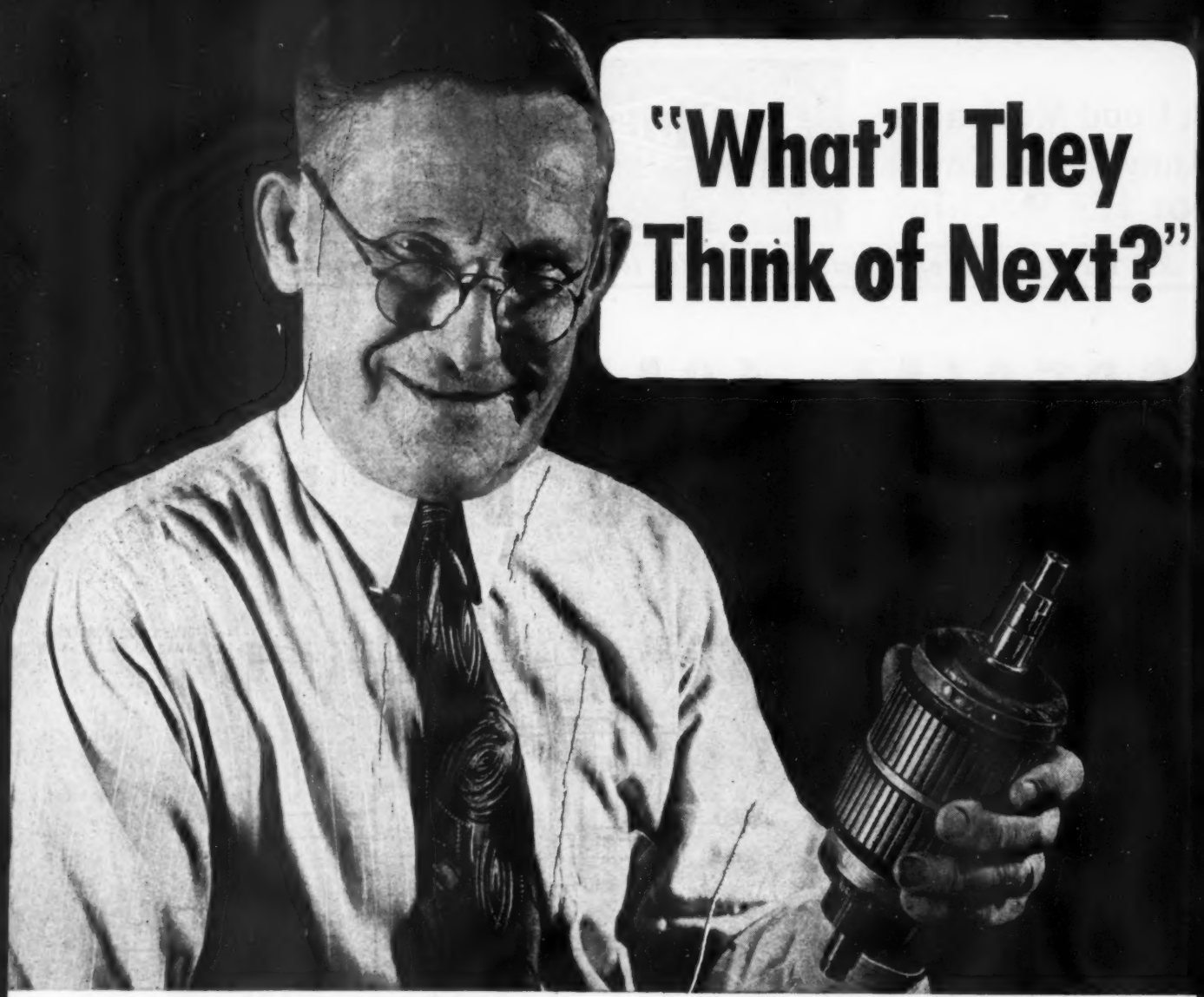
RANGE OF LEFT HAND HOLDERS			
RANGE	A	B	MAXIMUM THD. LENGTH
4" to 4 5/16"	11½"	1 13/16"	7½"
4 5/16" to 5⅛"	11½"	1 13/16"	7½"

RANGE OF RIGHT HAND HOLDERS			
RANGE	A	B	MAXIMUM THD. LENGTH
2½" to 3½"	11⅞"	1⅞"	7½"
3½" to 4½"	11⅞"	1⅞"	7½"
4½" to 5"	12"	2¼"	7⅞"
5" to 6"	12"	5¼"	4"

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS



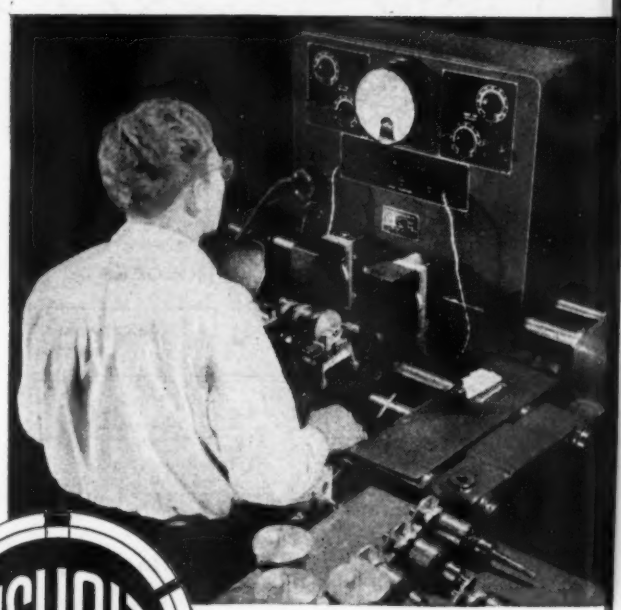
"What'll They Think of Next?"

"AMAZING how they do things these days! Only one thousandth of an ounce out of balance . . . yet they caught it in a flash. In just a few seconds, the unbalanced forces in this armature were *located* and *measured* . . . and corrections clearly indicated by a DYNETRIC BALANCING MACHINE*. That's modern electronics for you!

"Think of the crude mechanical means we used to employ for static and dynamic balance. And the time it took! Now, electrons catch any vibration due to unbalance down to .000025" . . . in all kinds of rotating parts, from half an ounce up to *fifty tons!*

"Yes, many of the tough jobs of my day have been reduced to a dial reading or the push of a button. And with a speed and accuracy we never thought possible. If you knew the old methods of determining balance, you should see the Dynetric Balancing Machine in action. You, too, will say, 'What'll they think of next?' "

*A development of the Westinghouse Research Laboratories.



DYNETRIC BALANCING MACHINE
have put static and dynamic balancing on a low-cost, mass production basis. No quality product involving high speed rotating parts can afford to be without it. Write for literature

GISHOLT

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Meet Mr. Quality

ONE LOOK AT Bill Seebode — 50 year man at Allis-Chalmers Norwood Works — tells you that he sleeps well nights.

One reason is that he and hundreds of his fellow craftsmen at Allis-Chalmers have won *and are keeping* the confidence of engineers and operating men throughout American Industry.

That means a lot to veterans like Bill who've made a career of building great motors.

Bill's a stator-winder, as you can see—a living example of the truism that *men* make motors.

No machine known can assemble the maze of wiring and insulation that goes into a stator with his skill and care. No machine can fully test how *well* he's done his job.

There's only one test . . . wait 5, 10, 15 years and *see*.

And that's the test that has proved Allis-Chalmers motors are *great* motors. That's why you hear it said so often: *"You can depend on Allis-Chalmers Motors!"*

Yes, hundreds of Allis-Chalmers men—*quality* men like Bill Seebode — know they have a big personal stake in every Allis-Chalmers motor. When they build a great motor for you, they're making a friend . . . and they know that's something no company and its workers can have too many of. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

• • •

♪ *Tune in the Boston Symphony, Blue Network, Saturday at 8:30 pm, EWT.*

AC WE WORK FOR VICTORY WE PLAN FOR PEACE

A 1729

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS

Landis Tool No. 12 Centerless Grinder

Your major concern in selecting the best centerless grinder for the job is, "Will it grind more parts to closer tolerances and finer finishes?"

To find the most satisfactory answer to this question, note the new, modern design features of the Landis Tool No. 12 Centerless. Then read the actual production achievements of this remarkable machine, at the right. You'll see why the Landis Tool Centerless has won unquestioned performance leadership in this field.

LANDIS TOOL

Precision Grinders

LANDIS TOOL CO. •

Leads in Performance

LANDIS TOOL No. 12 CENTERLESS GRINDER

New, modern features make possible the superior finishes and high production you can obtain with the Landis Tool Centerless. These include:

★ Faster stock removal to close limits and fine finish by rigid support of work in guide that extends up to center line of regulating wheel spindle.

★ Simple rheostat controlled adjustable speed drive gives speed adjustment with no interruption of the grinding cycle.

★ Manual or hydraulic traverse of regulating wheel base for rapid, accurate wheel alignment.

★ Improved construction for tilting regulating wheel base for through feed grinding.

★ Swiveling regulating wheel base for grinding tapers.

★ Quick, easy setup of single work rest for parallel or tapered work.

★ Single, convenient valve at operator position controls coolant for grinding and dressing.

For complete information on the No. 12 Centerless Grinder, write for your copy of Catalog T44. Landis Tool Company, Waynesboro, Pa.

Close Tolerance Grinding

Here's a remarkable example of close tolerance grinding. This plunger for a fuel injector had to be held to hairline tolerances and perfect roundness to provide an exact pressure-tight fit. The rigid construction of the Landis Tool No. 12 Centerless Grinder made possible grinding to the extreme limits required, in only 5 to 6 passes and a finish of 4 to 5 micro inches.

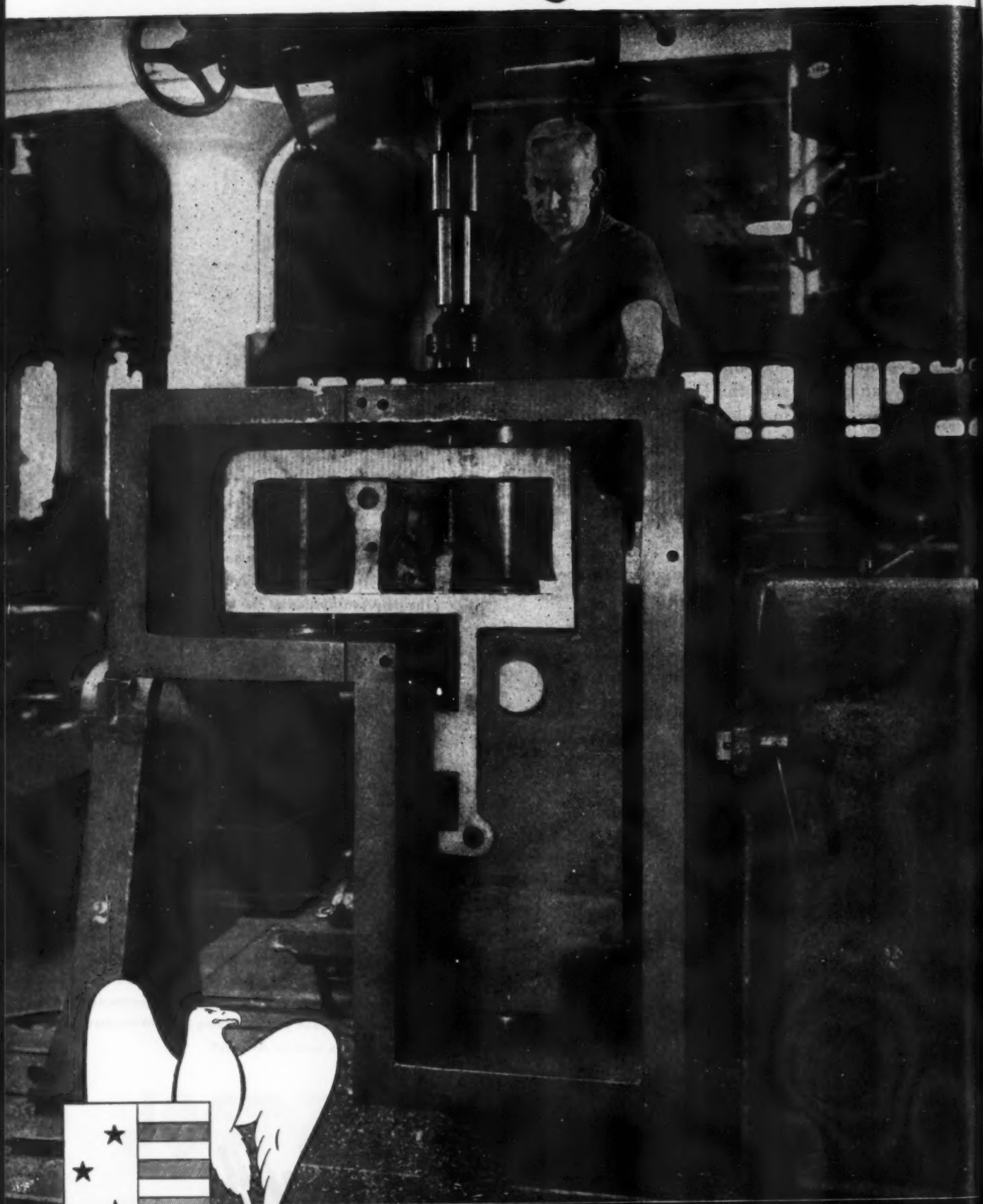
High Production Grinding

Here's a striking example of high production grinding. These bearing bushings were ground on the Landis Tool No. 12 Centerless Grinder at the rate of 27,600 parts in 8 hours. Yet tolerances were held throughout the production run to ½ thousandth! Have you a grinding job that requires volume production plus superior finishes? 20

LANDIS TOOL *Company*

WAYNESBORO, PA.

Make the Payroll Dollar



THE AMERICAN TOOL WORKS C

Produce More

Use "American" Hole Wizard Radials and the new trunnion stand technique for boring, facing, drilling and tapping.

These illustrations show a head frame being machined on an "American" Hole Wizard Radial Drill through a revolving jig mounted on an indexing trunnion stand with outboard support and tools used for the various operations.

When a jig is mounted on an indexing trunnion stand, it is easy for the operator to swing it from one plane to another, whereas, base mounted jigs, must be shifted, rolled or lifted, resulting in the expenditure of infinitely more operator energy and harmful jarring of the work in the jig.

For further advantages offered by the combination of "American" Hole Wizard Radials and indexing trunnion stands, write for Bulletin No. 458.

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

More Packard-Powered Mustangs
for the fighting front

NORTON GRINDERS *in the* PACKARD PLANT are setting Performance Records

Packard Motor Car Company, called upon to build a greatly increased number of Rolls-Royce Merlin engines for fighting planes, adopted Norton Cam-O-Matic Machines for grinding the cams.

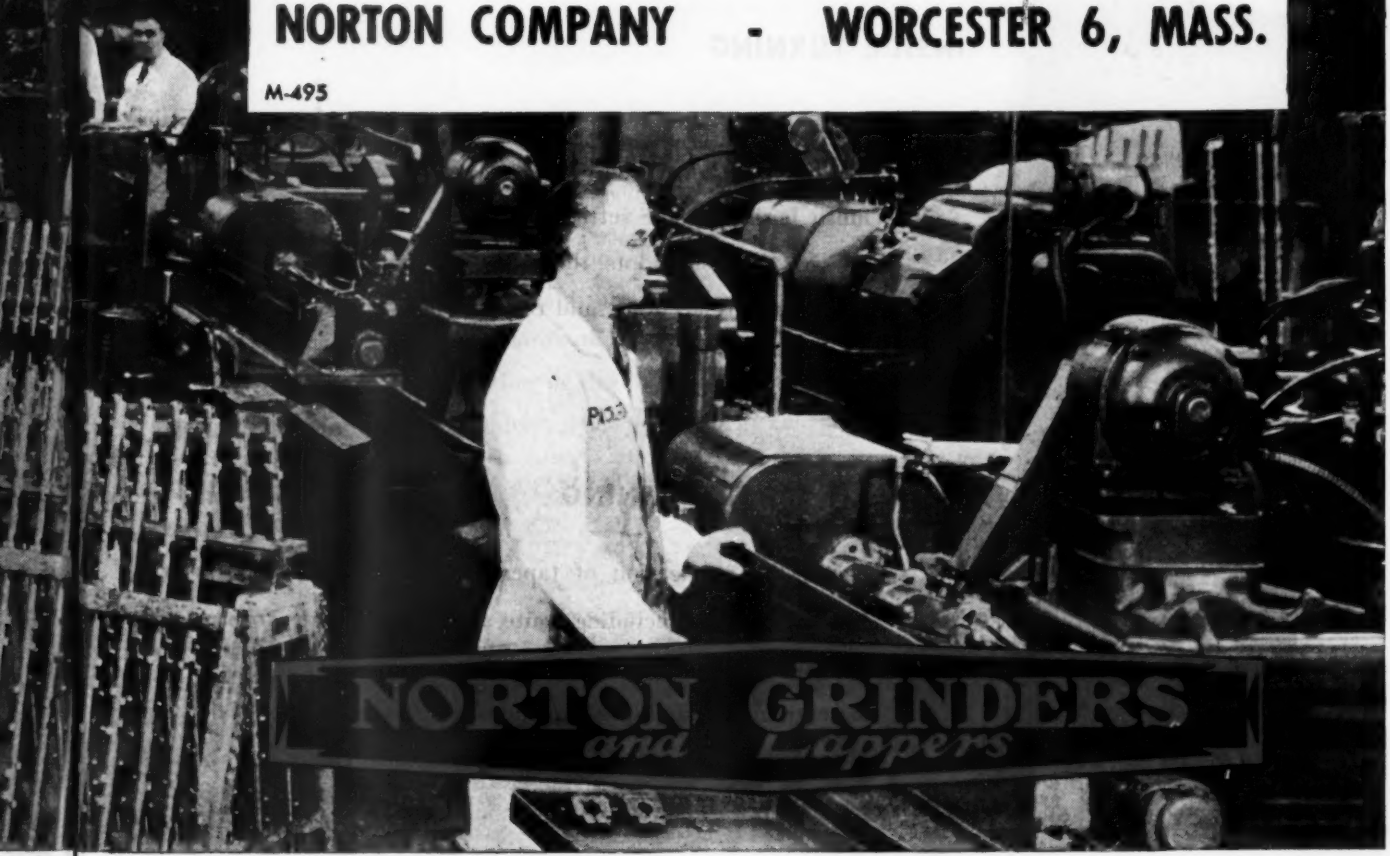
This important aircraft engine is being produced today in large volume to precise limits and quality of finish.

The Norton Cam-O-Matic operates through an automatic cycle moving from cam to cam, grinding each in turn, trues the wheel and stops—ready for the next shaft.

You, too, can depend on Norton engineers to help you with your grinding problems.

NORTON COMPANY - WORCESTER 6, MASS.

M-495



Proved ways — to cut turning time

TOGETHER, the users and builders of machine tools have developed countless ways to save time in the war production job. New machines have been designed and old machines put to new uses to get the work out faster and to save man-hours.

In the booklets described here, Monarch has assembled some of the ways in which turning time and costs have been reduced on a wide variety of work. You may find here an idea that will help increase your present output. Certainly, you will find suggestions that will be worth exploring for your peacetime production. Any of the booklets is yours for the asking, but please order (on your business letterhead) by number indicated.

INSIDE TURNING

Covers methods of inside turning (or boring) on Monarch Turning Machine, including multiple boring, counterboring, rough and finish boring in one setting and other boring operations. Shows how, even for small lots, the cost of tools, jigs and fixtures is more than offset by accuracy and time saving. Bulletin No. 190.

MODERN TAPER TURNING

Shows the application of taper turning equipment for a wide variety of work, including acute angle, steep angle, form turning and boring from metal templates, long turning and boring, and turning extremely long tapers. Includes practical examples of this type of work which may be applied in your plant. Bulletin No. 1955A.

THE SHAPEMASTER

Covers the use of Monarch SHAPEMASTER for turning, boring and facing various types of multi-sided shapes in irregular contour pieces. Shows the application of this equipment to the making of molds and dies for plastic and glass production as well as for metal work. Bulletin No. 199.

SPECIAL COST-CUTTING MACHINES

Shows examples of turning unusual jobs with speed, precision and economy, by means of special Monarch machines or attachments. Includes turning, boring, facing, inside finishing, compound tapers and other work beyond the ability of standard machines. Indicates time and cost-saving methods used in a wide range of work. Bulletin No. 193.

MONARCH LATHES

Condensed catalog of Monarch Toolmaker's and Production Lathes, with brief descriptions and specifications. Includes Monarch Magnamatic, Monarch Automatic Sizing and Monarch-Keller Form Turning Lathes. Complete specifications and descriptions are available for any of the Monarch machines included in this condensed catalog. Ask for Bulletin No. 198.

Time and cost-saving features of Monarch Turning Machines will become increasingly more valuable as American industry moves into peacetime production. Higher wage costs must be offset by lower machine costs, and Monarch offers the way to extensive economies. Our engineers will gladly work with you in the selection or development of Monarch Turning Machines for your present or postwar requirements. Address us at the factory or through any factory branch or representative.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

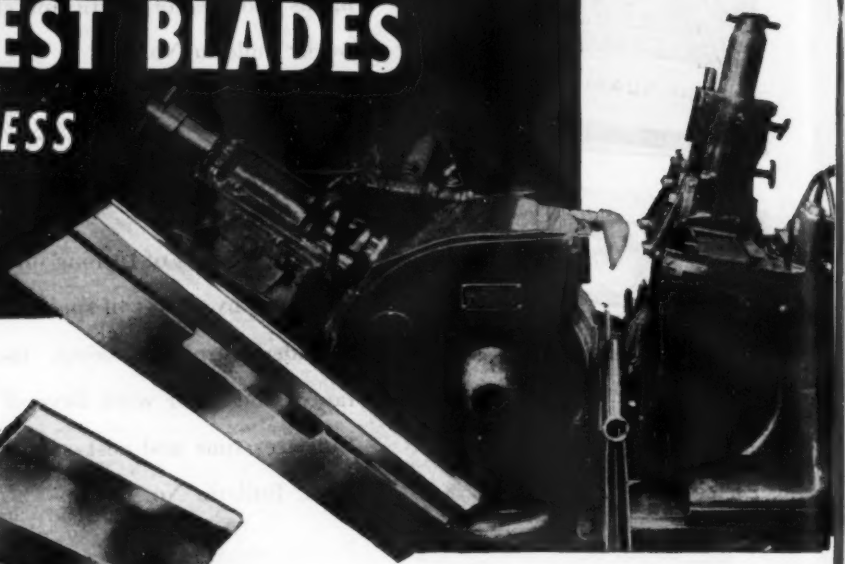
DIRECT FACTORY BRANCHES:

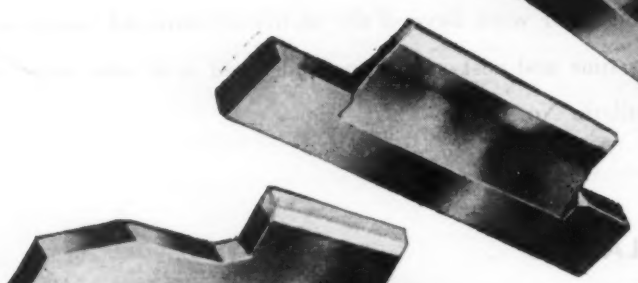
622 W. Washington Blvd., Chicago, Ill. • 801 Fisher Bldg., Detroit, Mich. • 635 Industrial Office Bldg., Newark, N. J.
10465 Carnegie Ave., Cleveland, Ohio • 512 Empire Bldg., Pittsburgh, Pa.

Representatives in principal cities

Monarch Saves Time

Hard-Surfaced
WORK REST BLADES
FOR CENTERLESS GRINDERS





Use the Blade with a **"GENEROUS AMOUNT OF HARD-SURFACE"** *for Longer Life*

A new Scully method of flowing Stellite to a generous depth produces Work Rest Blades with greater wear-resistant qualities.

The tough Stellited edge has less tendency to chip or flake so scratching and scoring of the work piece is essentially eliminated.

Fewer regrinds and reduced setup time permit the continuous Centerless Grinding of long-run jobs with a consistent degree of precision accuracy.

An economical price effects a substantial saving in cost.

To receive a copy of our new illustrated catalog, fill in and mail the coupon shown below.

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The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

Through recent explorations our known reserves of bauxite (source of aluminum) have been increased by more than 100 million tons. *Science News Letter.*

get ready with CONE for tomorrow

The National Postwar Products Exposition is scheduled to open March first at the Chicago Coliseum. *Marcus W. Hinson, Ex. Mgr. 1513 S. Wabash Ave., Chicago 5.*

get ready with CONE for tomorrow

A new tractor-drawn farm implement plows, discs and harrows in one operation. *"Till-Master", Till-Master Mfg. Co., Portland, Oregon.*

get ready with CONE for tomorrow

Today's scientists have revived a four-thousand year old method of killing insect pests with fine dusts. These dusts adhere to the insect's skin or casing and interfere with its water balance. Death results from thirst. *Dr. H. V. A. Briscoe, Imperial College, London.*

get ready with CONE for tomorrow

A railroad now has one-hundred plywood box cars and one thousand on order. The weight saving is said to be about two tons per car. *Great Northern Railway.*

get ready with CONE for tomorrow

A new "de-barker" is being used in some pulp mills that removes the bark from logs by the force of a jet of water at 650 pounds pressure without removing any wood. The saving in wood is said to be as high as 20%. *Scientific American, Oct. 1944.*

get ready with CONE for tomorrow

The continuous injection molding of plastics is made possible by a new machine. *Chrysler Corp.*

get ready with CONE for tomorrow

A new electric iron requires no cord but absorbs heat from an electrically heated and thermostatically controlled base. *Eureka Vacuum Cleaner Co., Detroit.*

Jet propulsion may be used to power sailplanes and gliders and, in miniature, for flying models. *McGraw-Hill Overseas' Digest.*

get ready with CONE for tomorrow

A university engineer has announced the discovery of a new type of concrete, useful for building construction, that is stronger than steel and lighter than aluminum. *Northwestern University.*

get ready with CONE for tomorrow

A new $1,800, four-room house will come directly off the assembly line on to a truck for delivery. *"Wingfoot Homes", Goodyear Tire and Rubber Co.*

get ready with CONE for tomorrow

A "zipper" fastening has been developed that is claimed to seal in liquids and gases. *B. F. Goodrich Co.*

It has been stated that the weight of aircraft engines has been reduced about 40% since the beginning of the war. *Aircraft Yearbook 1944.*

get ready with CONE for tomorrow

Manufacturers of the "jeep" plan to sell it to farmers and are reported to have ordered 25,000 bodies for this purpose. *Willys Overland.*

get ready with CONE for tomorrow

A machine has been patented for making barrels out of cardboard for packing butter, flour, sugar, chemicals, fruits, or small parts. *Everett Industries, Akron.*

get ready with CONE for tomorrow

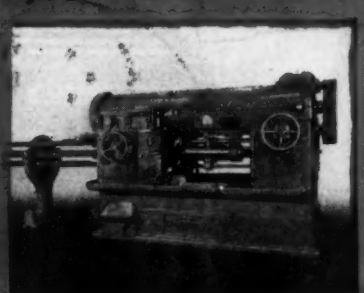
Aviation and electrical engineers are collaborating on an electric drive for aircraft. This will, if practical, permit the location of engines in the fuselage and do away with nacelles in the wings. *Hughes Aircraft Co. and Westinghouse.*

get ready with CONE for tomorrow

One of the country's largest grocery chains is planning to ship fresh fruits and vegetables to its markets by airplane. *A & P.*

Here is performance that is definitely AHEAD

This part calls for extreme accuracy and yet requires wide forming cuts on a variety of diameters. In one position an attachment taps an inside thread 5/16"-18 while, at the same time, a die cuts an outside thread 5/8"-27. Produced on the 6" Spindle Conomatic at the rate of 12.5 seconds per part.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

14

ELECTRICAL CONTROL

MAKES ALL GRINDING JOBS *FAST* JOBS ON Nos. 20 AND 22 . . WITH REPEAT ACCURACY

KNOB TYPE MANUAL CONTROL
. . as well as SEMI-AUTOMATIC
by cross feed handwheel . . . .

1. **Shortened Set-up Time**
2. **Ease and Rapidity of Operation**

. . . It will pay you to learn how Nos. 20 and 22 Plain Grinding Machines can help in *your* precision grinding.

BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

BROWN & SHARPE

MAKES THE Bryant Thread Gage

4 TO 5 TIMES FASTER THAN PLUG OR RING GAGING

Bryant Thread Gages completely eliminate tedious, time-consuming threading of gages into or onto parts being inspected.

When inspecting internal parts, the segments are retracted by the control lever — the work is dropped over the segments — the control lever is released, and *immediately* engagement is made on *all the threads.* A *partial* turn of the work indicates overall accuracy within required tolerances, or accumulated inaccuracies of lead, taper, pitch diameter, thread form or the presence of burrs. External threads are inspected in the same manner, except that the segments are expanded to allow the part to be dropped inside.

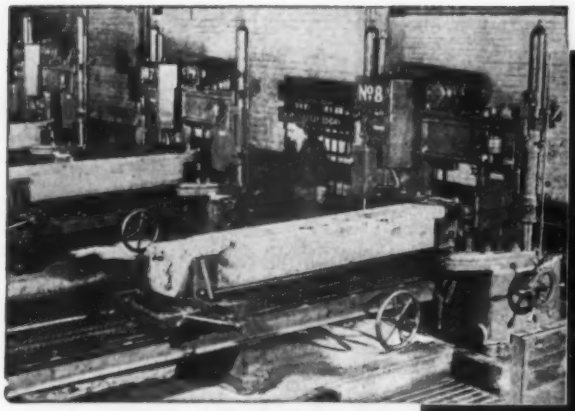
The unique design of Bryant Thread Gages practically eliminates wear on the segments — it allows inexperienced help to inspect threaded parts four to five times faster than experienced inspectors using conventional gages — it eliminates the "feel" required in plug and ring gaging — it offers a method for complete, overall inspection of master plug and ring gages, and a method of transferring their accuracy to production threaded parts.

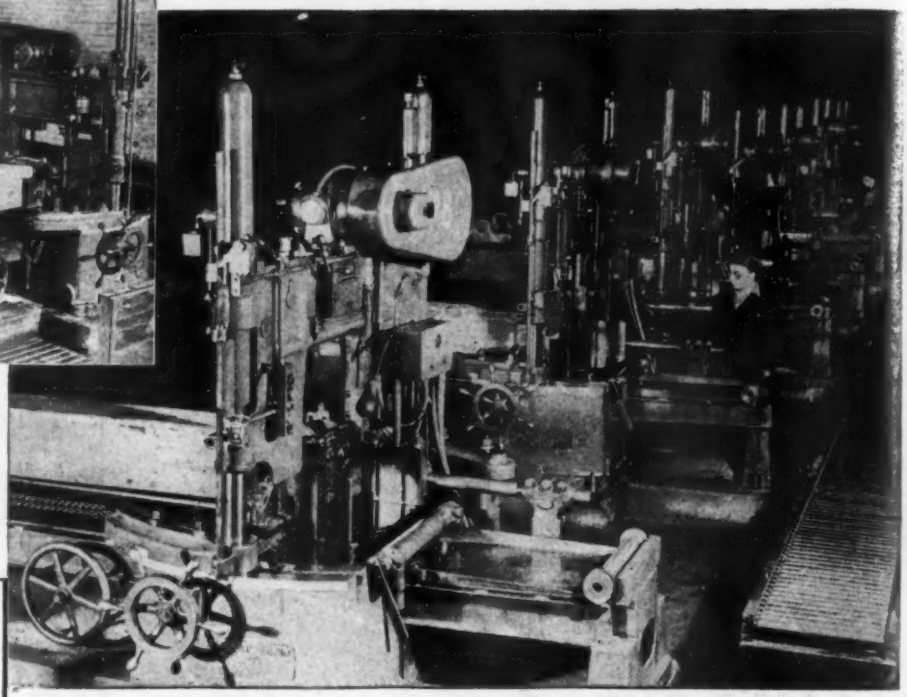
Write today for illustrated folder No. G2 which gives complete details.

BUILT IN 3 STANDARD MODELS

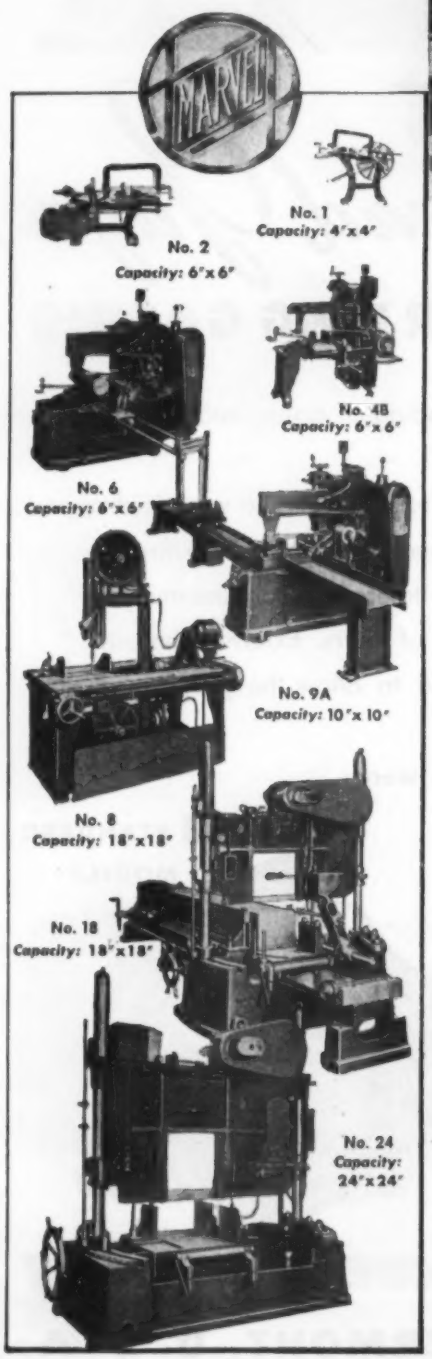
Bryant **CHUCKING GRINDER COMPANY**

SPRINGFIELD, VERMONT, U. S. A.





Part of the row of No. 18 MARVEL Giant Hydraulic Hack Saws used to crop and cut-off test slices for metallurgical tests for large billets of tough alloy steels.



MARVEL No. 18 Hydraulics 12 in a row!

When a greatly expanded steel plant, near Canton, Ohio faced the problem of cropping and cutting-off test samples from large alloy billets, in WARTIME quantities and at wartime speed, they checked the performance of all types of cutting-off equipment in all their other company plants, and selected MARVEL No. 18 Giant Hydraulic Hack Saws for this "tough" job.

Now this row of twelve MARVEL No. 18 Hydraulics shown above, operating continuously, 24 hours a day on tough alloy billets of from 14" to 16" cross section, handle this tremendous, heavy duty cutting-off job without a hitch and with a minimum of man hours—only four operators per shift.

When you have a cutting-off problem your most logical first step is to check with your local MARVEL Sawing Engineer for recommendations of methods and equipment.

ARMSTRONG-BLUM MFG., CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave. **Chicago 39, U. S. A.**

Eastern Sales Office: 225 Lafayette St., N. Y. 12.

MARVEL SAWS

ROTO SHAVING

Finishes

CYLINDRICAL and CONICAL SURFACES

Faster and Better

On parts having a hardness of 38 Rockwell or less, Roto Shaving is better than grinding because it is faster, more economical and the finished surfaces can be maintained to a high degree of smoothness. Production rates are about three times that of grinding.

A 100% complete inspection of a lot of 4,000 consecutive pieces reveals a maximum variation of .001″ on the diameters. Stock removed ranges from .010″ to .015″ on the flanges and .020″ on cylindrical diameters.

A special fine pitch milling cutter is used for this work and the work is rotated during the cut but at lower speeds than for grinding. These cutters wear very slowly and may be sharpened on ordinary shop equipment. The gradual wear materially reduces machine adjustments.

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

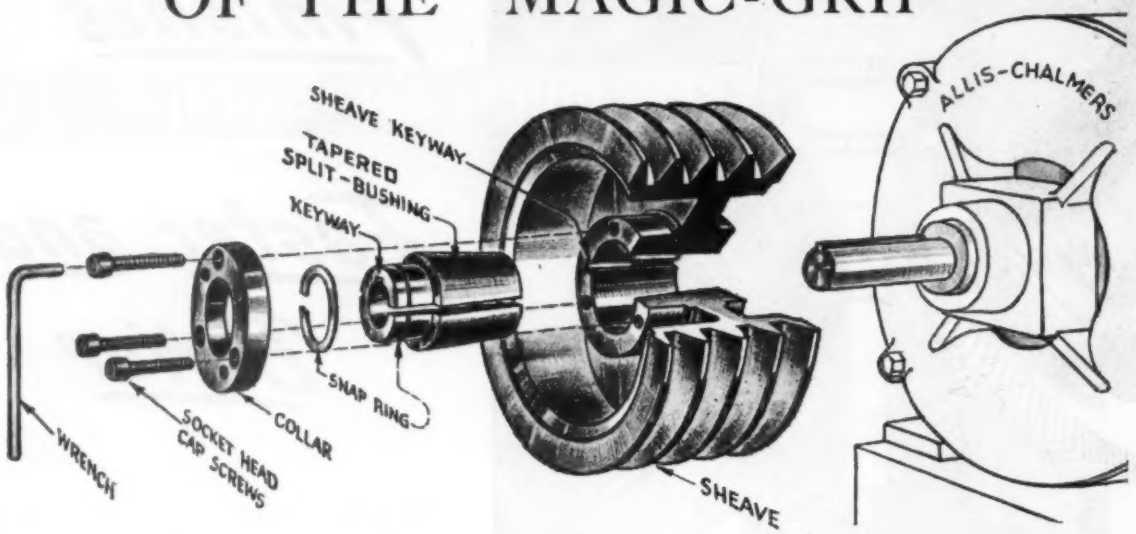
5400 ST. JEAN · DETROIT 13, MICH.

Specialists on **SPUR AND HELICAL INVOLUTE GEAR PRACTICE**

Originators of **ROTARY SHAVING AND ELLIPTOID TOOTH FORMS**

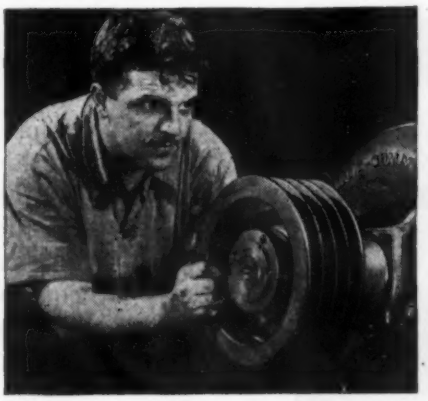
Here's the Secret

OF THE "MAGIC-GRIP"



Exploded view shows why Allis-Chalmers' new "Magic-Grip" Sheave goes on *as a unit in 3 easy steps.* It's the fastest mounting sheave on the market—at no extra cost.

1 Place sheave on shaft. Slides on smoothly because clearance is provided by expanded bushing. There's *no* hammering — *no* forcing! Complete sheave and bushing unit comes intact—ready for quick, easy mounting.



2 Slide to desired position. Sliding easily, sheave can be placed *exactly* according to straight-edge . . . giving you true alignment with resulting smooth performance. A minimum of time is required.

3 Tighten three capscrews — and it's ready to go! Entire sheave is locked securely to shaft and *grips like magic!* No set screws to damage shaft. Send for Bulletin B6310. Allis-Chalmers, Milwaukee 1, Wis.

A 1764

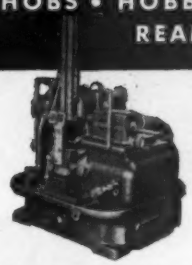
Allis-Chalmers Texrope

"MAGIC-GRIP" **SHEAVES**

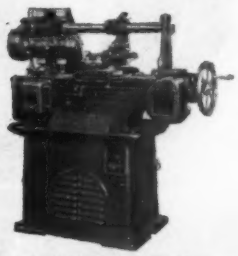
Dependable FOR PRODUCTION and ACCURACY

BARBER-COLMAN

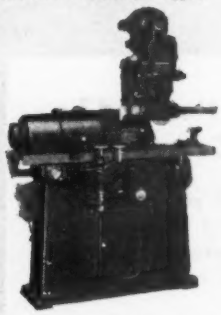
HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS



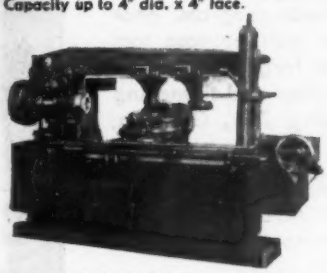
TYPE S Automatic Hobbing Machine — For production of small precision gears up to 1" dia. x ½" face and 200 D.P.



No. 3 Standard Hobbing Machine — Capacity: 5" dia. x 7" face. 12 Pitch and finer. Built also in Precision Type.



No. 3 Automatic Hob Sharpening Machine for hobs and formed cutters. Capacity up to 4" dia. x 4" face.

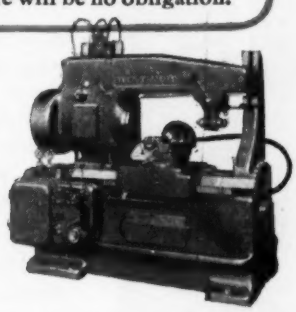


TYPE A Hobbing Machine — a rigid, accurate machine for general purpose or production hobbing. Capacity: 12" dia. x 12" face. 4 Pitch and finer.

THE YEAR 1945 should be an extremely interesting one from your point of view. You are going to be looking for new machines and new tools — machines and tools that will produce better, faster, and more accurately than any you have ever had before. We offer for your consideration the wide variety of products which are shown here. We urge you to investigate their outstanding qualities of durability, accuracy, and production capacity. We suggest our engineering and advisory service as an opportunity to gain money-saving, product-improving ideas from practical men with many years of experience.

Write for these bulletins. Complete specifications and detailed description of each Barber-Colman product will be sent upon request. There will be no obligation.

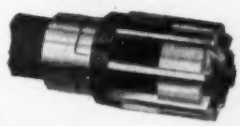
TYPE T Taper Spline Hobbing Machine — May be used also on general hobbing work within its capacity. Spur and spiral gears, straight and involute splines, etc., may be hobbed.



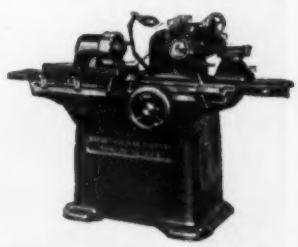
TYPE D Hobbing Machine — a heavy duty high production machine powered hydraulically. Capacity: 14" dia. x 14" face. 3 Pitch and finer.

HOBS — Ground and Unground, Standard and Special.

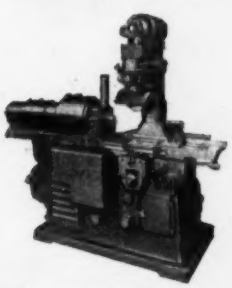
MILLING CUTTERS — "Paraform" Design, Formed, Standard and Special



REAMERS — Fluted, Inserted Blade, and "Pinwedge" Expansible Reamers.



COMBINATION Sharpening Machine — Sharpens hobs, cutters and reamers; straight gashed up to 24" stroke; or maximum 30° helix with 8" stroke.



No. 4 Automatic Hob Sharpening Machine for hobs and formed cutters. Capacity up to 12" dia. x 12" face.

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS

ARMSTRONG

Tool Completely for War Production and be Completely Tooled for Post-war Competition

With the correct ARMSTRONG TOOL HOLDERS you can greatly increase (often double) speeds and feeds of every operation on lathes, planers, slotters, shapers, turret lathes and screw machines—can materially increase the output of war materials and help speed victory.

With the same ARMSTRONG TOOL HOLDERS you will be prepared to instantly start on your post-war program, once victory is won, for each is a permanent, multi-purpose tool that does the work of a complete set of forged tools—that reduces tooling-up to the selection of a cutter and tightening of a set screw . . . that "Saves: All Forging, 70% Grinding, and 90% High Speed Steel."

Equip all machine tools with their complete complement of ARMSTRONG TOOL HOLDERS now, to increase war production, and to be ready for post-war competition.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

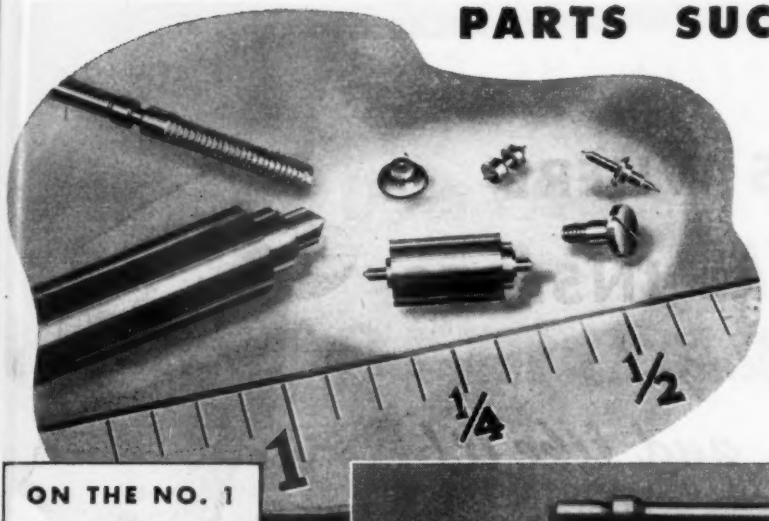
315 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Warehouse and Sales
199 Lafayette St., New York 12, N. Y.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 90% of the Machine

PARTS SUCH AS THESE WITH



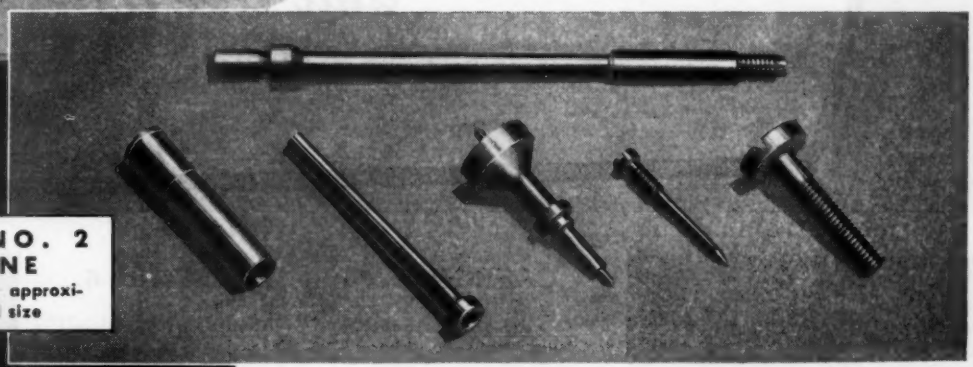
Extremely

CLOSE TOLERANCES

Extremely

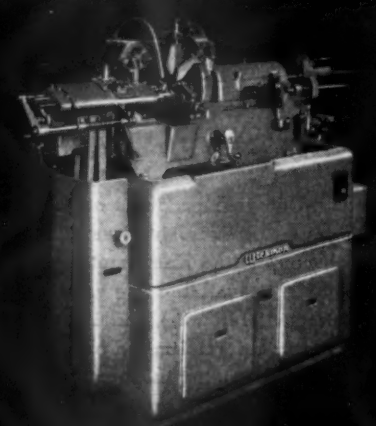
FINE FINISHES

ON THE NO. 1 MACHINE



ON THE NO. 2 MACHINE
Parts shown are approximately actual size

NO. 1 AUTOMATIC 5/32" BAR CAPACITY



NO. 2 AUTOMATIC 1/2" BAR CAPACITY

Produced Without Secondary Operations

ON Wickman SWISS TYPE AUTOMATICS

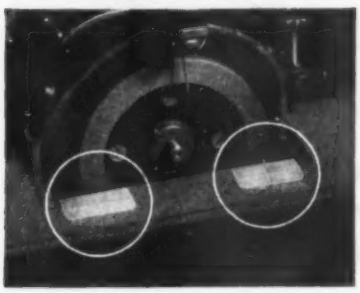
Wickman Swiss Type Automatics are precision-built machines especially suited to the manufacture from bar stock of small slender parts requiring extreme accuracy and high finish. Regardless of whether components have pivot points, back shoulders, multiple diameters, tapers, bevels, threading, etc., they are produced in simple operations.

Machines in two sizes and all necessary attachments and tools are supplied by Wickman. Full information will be sent you immediately upon request.

THE Wickman CORPORATION

15539 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

5 CASES WHERE KENNAMETAL INSERTS *Take a licking and like it!*



CASE No. 1

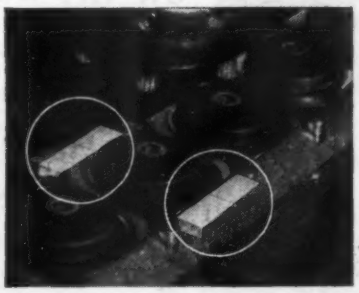
Condition: Grinder table had to be resurfaced frequently to maintain true grinding of tool angles.

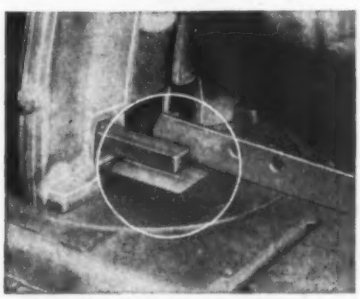
Correction: Kennametal inserts provide true, flat surfaces that show no appreciable wear after many months' service.

CASE No. 4

Condition: Wire cleaning brushes cut deep into steel leveling guides in less than one day.

Correction: Kennametal inserts resist the abrasion . . after month's service, are still in good shape.





CASE No. 2

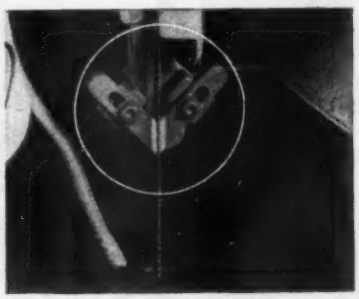
Condition: Worn sliding surfaces of abrasive saw rest allowed shank steel to wobble, causing uneven cut-off.

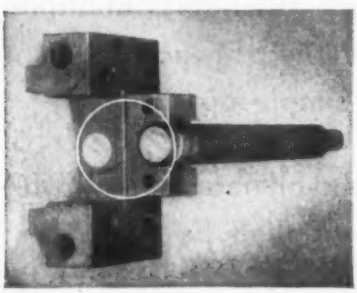
Correction: Inserts of Kennametal make smooth surface that outwears steel up to 100 times.

CASE No. 5

Condition: Steel surfaces of band saw guides wore quickly, allowing saw to weave and cause uneven profiling.

Correction: Inserts of wear-resistant Kennametal provide non-galling surfaces that guide the saw straight and true.





CASE No. 3

Condition: Steel parts of vise clamping mechanism badly galled by twisting action.

Correction: Kennametal discs, at abutting points, minimize wear; permit jaw to be closed securely, opened readily, with less effort.

WHAT'S YOUR CASE?

If the service life of your products or production machinery is shortened by excessive wear . . . incorporate extremely hard, non-galling Kennametal parts at critical points. Kennametal is available in a variety of standard shapes (balls, discs, flat blanks), and it can be molded into almost any special form, limited only by reasonable proportions. Write for catalog information.

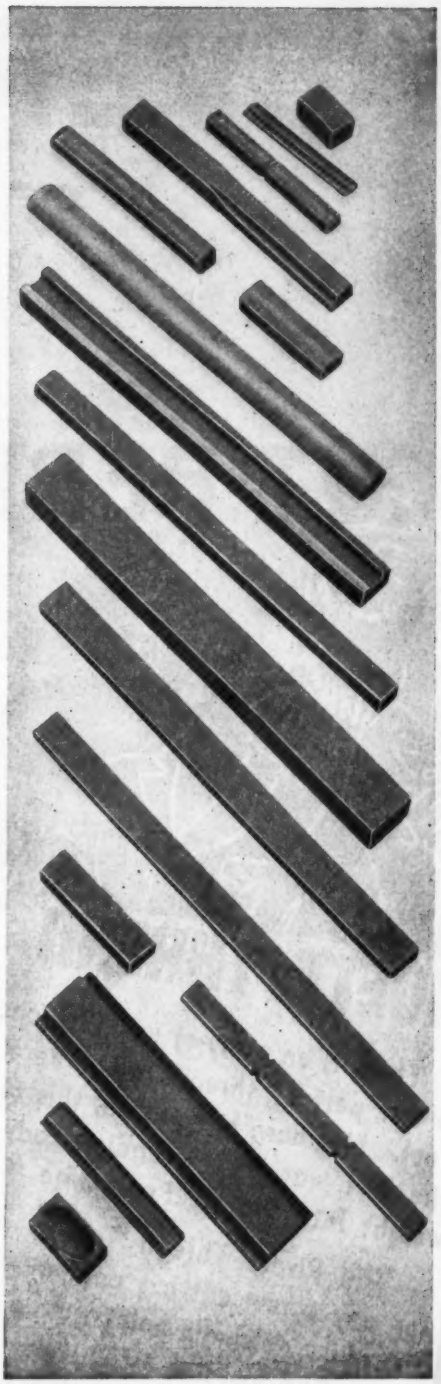
KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

SAID THE FIELD TEST REPORT

"AN OUTSTANDING Performance"



● Time after time this phrase is used by our field engineers reporting on tests of Mid-West Abrasive Company products in competition with other abrasives.

A typical report reads:

"Our 2.80 JY-11 wheel gave an outstanding performance on a test involving grinding intake and exhaust valves on airplane engines. It produced excellent finish, with rapid stock removal, minimum temperature rise, and almost THREE TIMES THE NUMBER of valves produced by competitive wheel."

Let one of our staff of highly-trained field engineers make a study of your abrasive problem. You'll find there's a Mid-West item to fill every need. Prompt delivery on grinding wheels, honing stones, sandpaper, rubbing bricks, sharpening stones, or any product in the Mid-West line.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso	1960 E. Milwaukee	Rochester
Mich.	Detroit 11, Mich.	Pa.

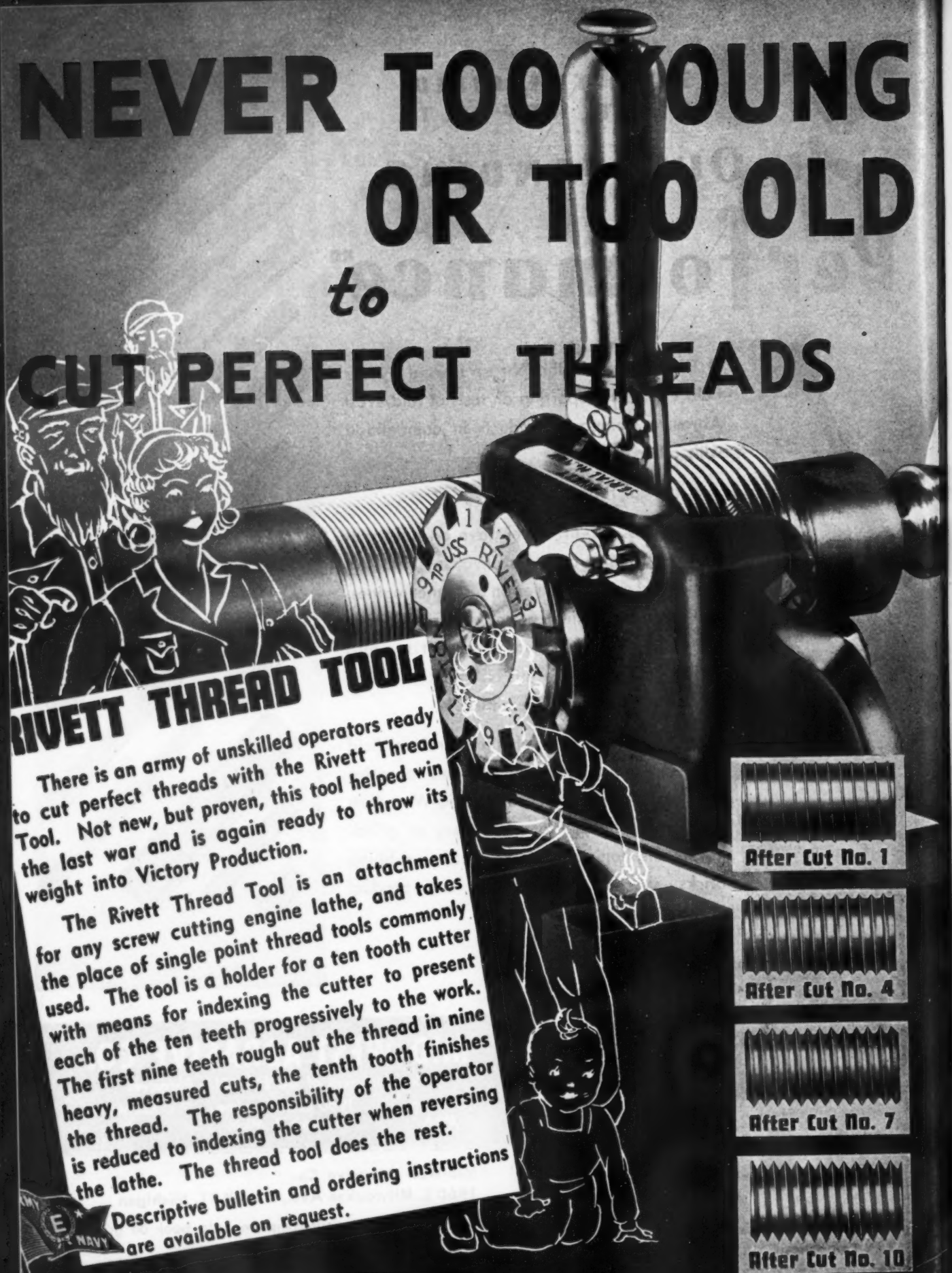
Mid-West Abrasive Co.
1960 E. Milwaukee Ave., Detroit 11, Michigan

Please send me your complete data book on grinding wheels.

NAME_____

ADDRESS_____

NEVER TOO YOUNG OR TOO OLD *to* CUT PERFECT THREADS



RIVETT THREAD TOOL

There is an army of unskilled operators ready to cut perfect threads with the Rivett Thread Tool. Not new, but proven, this tool helped win the last war and is again ready to throw its weight into Victory Production.

The Rivett Thread Tool is an attachment for any screw cutting engine lathe, and takes the place of single point thread tools commonly used. The tool is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth progressively to the work. The first nine teeth rough out the thread in nine heavy, measured cuts, the tenth tooth finishes the thread. The responsibility of the operator is reduced to indexing the cutter when reversing the lathe. The thread tool does the rest.

Descriptive bulletin and ordering instructions are available on request.

After Cut No. 1

After Cut No. 4

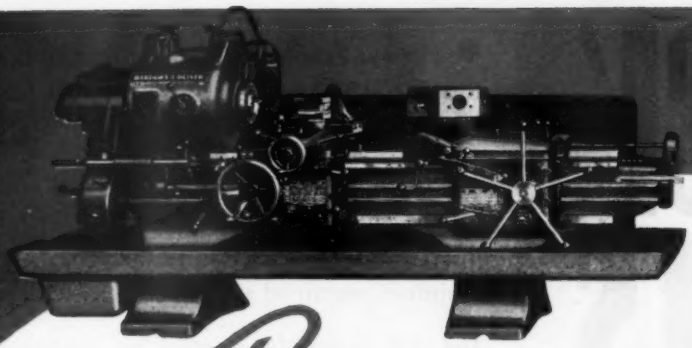
After Cut No. 7

After Cut No. 10

RIVETT

LATHE & GRINDER INC

BRIGHTON·BOSTON·MASS



Bardons and Oliver

Power RAPID TRAVERSE

To the cross slide carriage requires only a gentle pressure of the left hand. It means more parts produced at the end of the shift. Yet the operator feels far less tired from his day's work.

An independent motor fully enclosed in the bed operates the power rapid traverse to both saddle and carriage. A safety slip friction clutch in the drive train provides gentle starting and easy action. An adjustable limit stop automatically disengages the saddle traverse at the end of the bed.

You will want to learn more about the many time and labor saving features of the BARDONS & OLIVER NO. 21 SADDLE TYPE UNIVERSAL TURRET LATHE.

Write for a catalog today.

BARDONS & OLIVER, INC.
1133 WEST 9TH STREET • CLEVELAND 13, OHIO

FOSDICK RADIALS

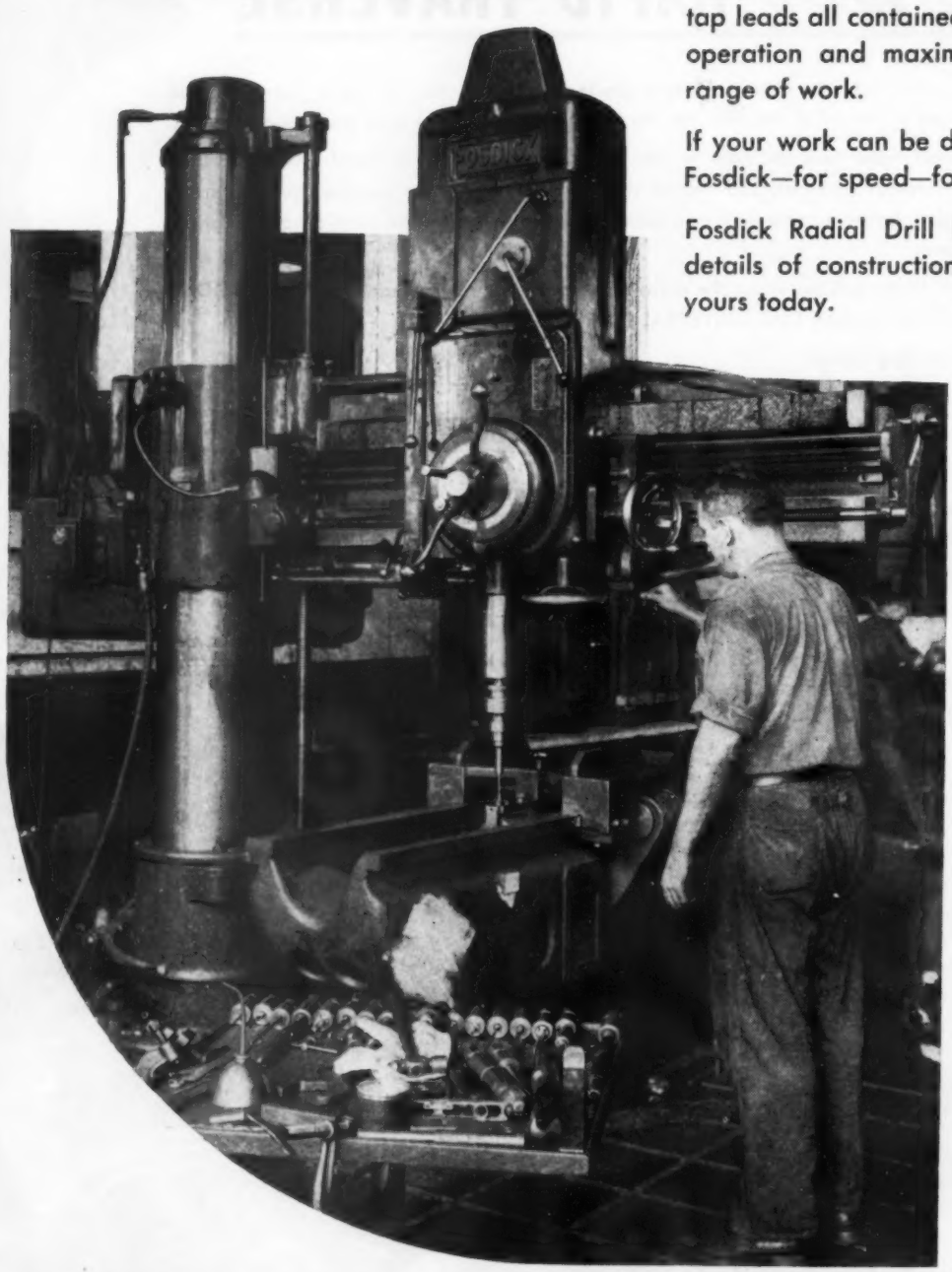
● Here a Fosdick Hydraulic Radial is drilling and tapping 1290 pound base castings for the manufacturer of grinding machines.

This is only one of many jobs that find their way to this sturdy, well balanced radial. Not only is this radial easy to handle but has the rigidity to maintain required tolerances.

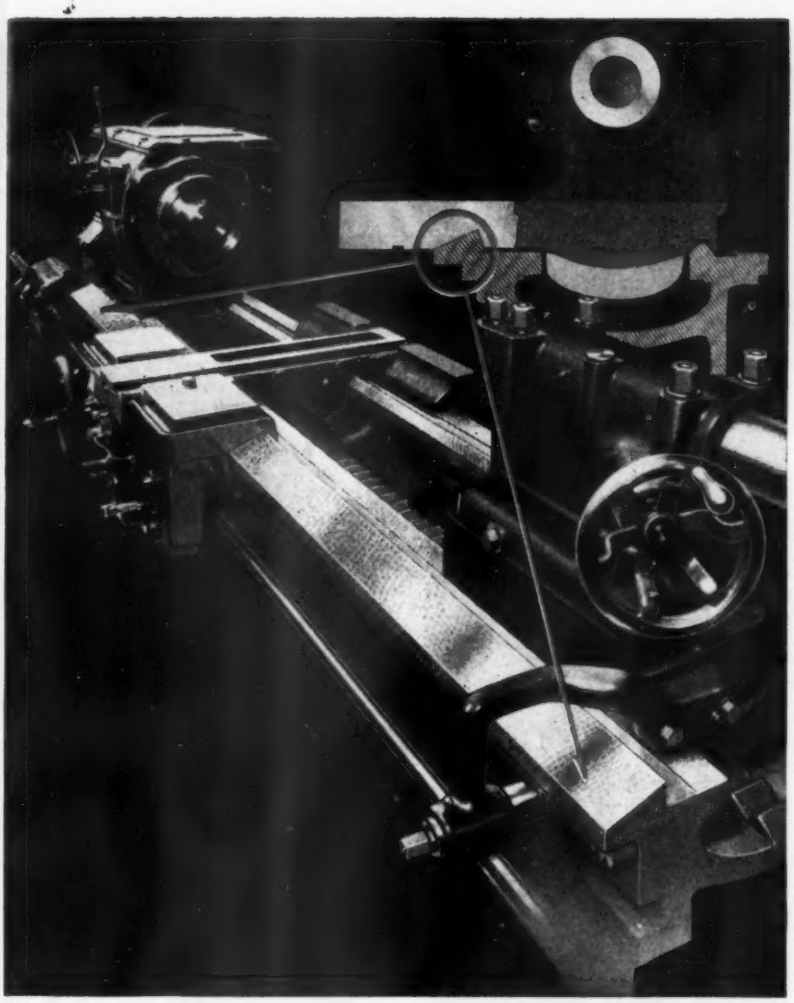
The full hydraulic control by means of a single hydraulic pump—centralization of controls—thirty-six spindle speeds—eighteen feeds and three pipe tap leads all contained in the head permit ease of operation and maximum production on a wide range of work.

If your work can be done on a Radial put it on a Fosdick—for speed—for accuracy—for economy.

Fosdick Radial Drill Bulletin RA gives complete details of construction and operation. Write for yours today.



FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO



TURNING QUESTIONS *ANSWERED*

WHY A COMPENSATING FRONT VEE?

On a LeBlond lathe, the front of the carriage slides on a Compensating Vee guide or way. One side of it is machined to provide an angle of 15 degrees, the other an angle of 70 degrees. This 70 degree side is fully three times as wide as the usual inverted Vee way. The 15 degree side serves a double purpose. It presents a surface at right angles to the thrust of the tools, preventing any tendency of the carriage to bind or climb, even under the heaviest cuts. Secondly, it compensates for wear of both the carriage and bed ways.

LEBLOND FIELD ENGINEERS are prepared to help you in your development work, particularly along the lines of the difficult, the out-of-the-ordinary turning problems. The accumulated knowledge of every manufacturing trend in good times and bad—peace and war—gained over a period of nearly 60 years from thousands of installations all over the world, is yours for the asking. Contact our nearest dealer or write—
Department FE-46.

SINCE 1887 the world has been turning to LeBlond for turning equipment.

WRITE FOR CATALOG!

★ YOUR BONDS BUY BOMBS ★
BUY A "BLOCK-BUSTER" TODAY!

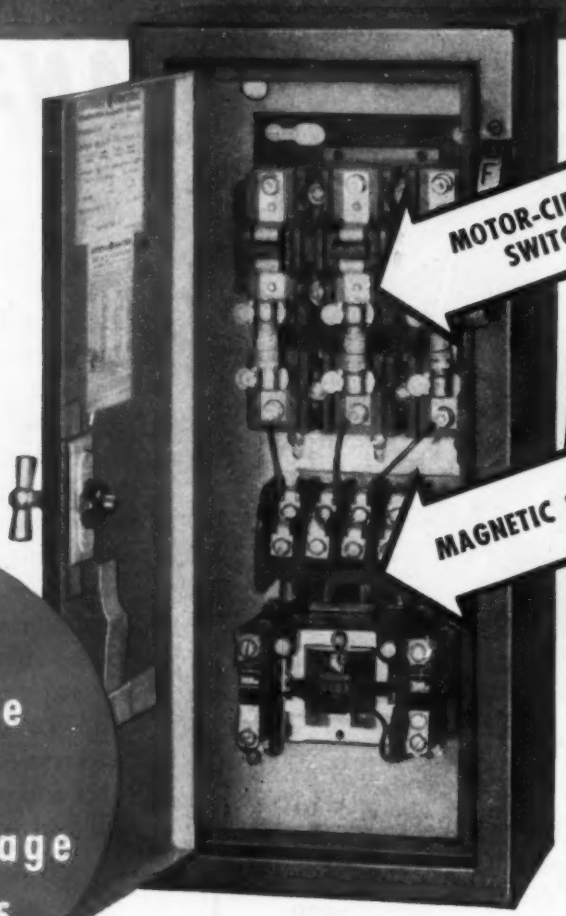
THE R. K. **LeBLOND**

MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 13, 103 Lafayette St., CAnal 6-5281
CHICAGO 6, 20 N. Wacker Dr., STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

MOTOR STARTERS EVERY TYPE,



TWO DEVICES IN ONE UNIT

For full-voltage starting of squirrel-cage a-c motors

COMBINATION STARTERS HELP YOU SAVE 6 WAYS

1. THEY SAVE MONEY—List price slightly more than for two separately mounted devices, but the difference is more than made up by the savings in wire, conduit, fittings, and installation costs.

2. SAVE ORDERING TIME—Instead of buying two separately mounted devices, you buy one factory co-ordinated unit that controls and protects your motor.

3. SPEED UP INSTALLATION—Users report a 50 per-cent reduction in mounting time, a 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You connect only 9 terminals—not 15.

4. SAVE WALL SPACE—You can mount combination starters in small, unused places either near to or remote from the operator.

5. CONSERVE MAN POWER—By eliminating one complete mounting job on every installation, you save valuable man power.

6. SAVE CRITICAL MATERIALS—Combination starters have less copper wire, steel conduit, and fittings than separately mounted devices.

—And they save your motors, too. The fuses, or the breaker, are co-ordinated with the thermal overload relays to give the complete motor protection under short-circuit or overload conditions.

Buy all the BONDS you can—and keep all you buy

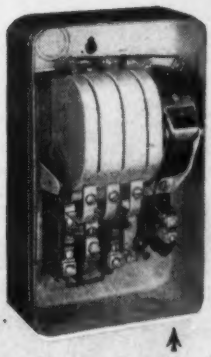
EVERY KIND, FOR EVERY MACHINE APPLICATION

★ DEPENDABLE

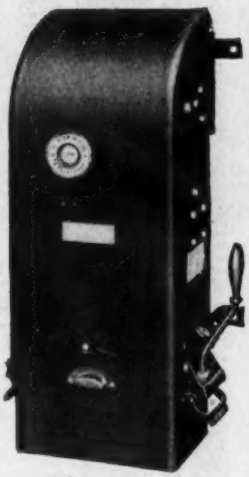
★ ATTRACTIVE IN APPEARANCE

★ DESIGNED TO BLEND WITH MODERN MACHINES

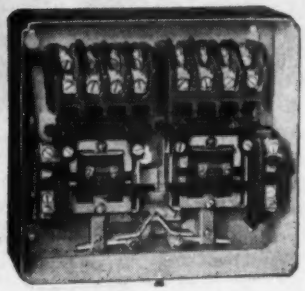
Motor-starting Switch—Recommended for full-voltage starting of small motors. Manually operated. Operating mechanism trips free on overload, making it impossible to hold switch closed under injurious conditions.



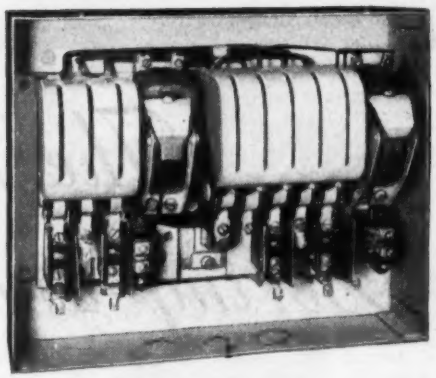
A-c Magnetic Starter—Can be used as a full-voltage starter of squirrel-cage motors, or as a primary switch for wound-rotor induction motors. Provides dependable operation, safety to the operator and to the machines.



A-c Magnetic Reversing Switch—Especially for use on machine-tool or similar applications where it is necessary to run the motor in forward and reverse directions. Provides full-voltage starting and overload protection in both directions of operation.



Reduced-voltage Starter—A manual, autotransformer-type starter for squirrel-cage induction motors. Undervoltage protection provides safety for the operator and the driven machine.



A-c Multispeed Magnetic Starter—A full-voltage starter for two-, three-, or four-speed squirrel-cage motors. Provides dependable operation where motors are started frequently, and where remote control is desired—on pumps, blowers, ventilating fans, and machine-tool applications.

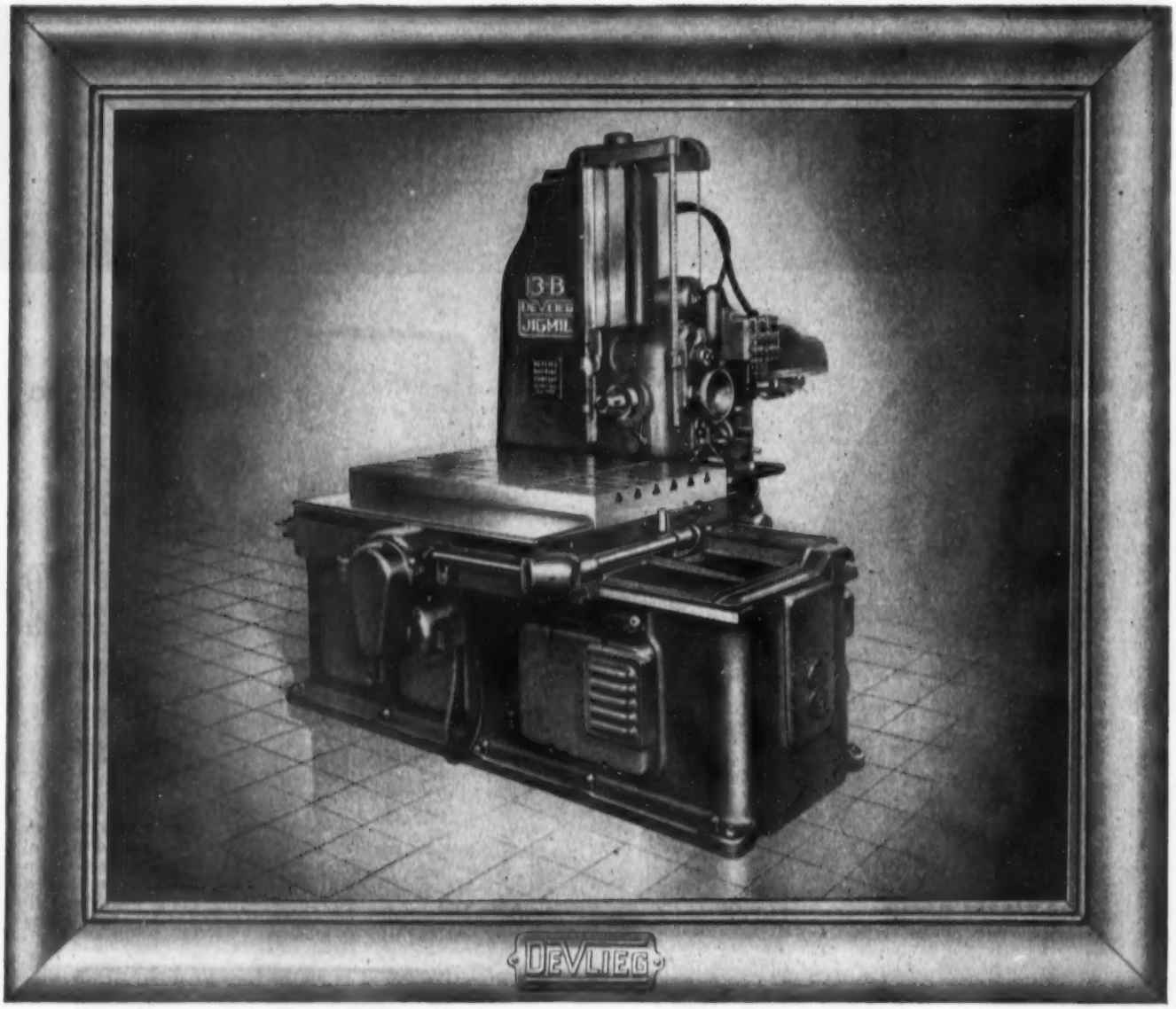
INDUSTRIAL CONTROL

WHAT IS YOUR APPLICATION?

G-E starters come in a variety of enclosures to meet any operating conditions in your plant. We'd like to send you any additional information you may want. And remember, our engineers will be glad to help you select the correct type of starter for your needs. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

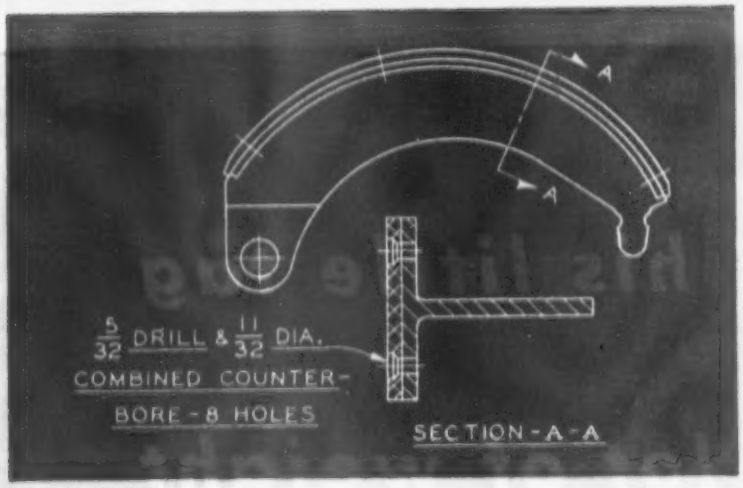
676-134-8920



The World's Finest Boring and Milling Machine

THIS new model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten thousandths part of an inch). Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL idea is a totally new approach to the problems of precision boring at a new low cost.

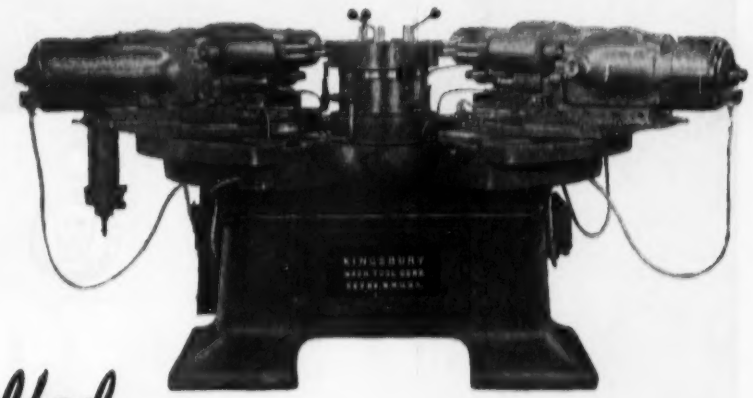
DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**



THIS IS A FLEXIMATIC

AUTOMOTIVE JOB!

Brake Shoe and Lining Production Speedily and Accurately Handled



FLEXIMATIC

by KINGSBURY

One important advantage of the FLEXIMATIC is the fact that it is a machine providing automatic indexing for performing various machining operations in a single chucking of the work.

This method is specifically applied to the Model GD Eight-Spindle Fleximatic arranged for drilling and counterboring brake shoes and linings shown in the accompanying drawing. Many variations of the machine are available, some for lining only and others for shoes only.

The FLEXIMATIC system pioneered by Kingsbury, involves a single base on which is mounted an indexing turret and standard metal cutting units for each operation such as drilling, reaming, counterboring, etc. The turret is designed to receive a number of duplicate work holding fixtures and can be rotated intermittently under control of the operator for presenting fixtures to loading and working stations. While units are in action, the turret is locked securely. All automatic operations are performed simultaneously while the operator removes a finished part and replaces it with a rough part at the loading station.

Speed, accuracy and easy handling even by unskilled operators are inherent in the performance of FLEXIMATICS.

Write today for illustrated Bulletin showing a number of different set-ups

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

This little tag carries a lot of weight

GET THIS FREE CHART FOR YOUR MEN

THE "FOUR FIRSTS" OF MOTOR MAINTENANCE

Handy wall chart for your maintenance department, stressing the four most common causes of motor failure and the precautions to take against them. Write for Chart SA-783. Westinghouse Electric & Mfg. Co., P. O. Box 868, Pittsburgh 30, Pennsylvania.

HERE'S WHAT IT MEANS IN KEEPING YOUR ELECTRICAL EQUIPMENT AT MAXIMUM PRODUCTIVE EFFICIENCY

Whenever you need major electrical repairs in your plant—or repair and overhaul of equipment outside your plant—remember this tag. It's the sign of a service that will get your machines back on the job quicker, assure longer life on repaired apparatus.

Only a piece of paper, you may say But back of it is a nationwide organization equipped to render a type of service that only a leading electrical manufacturer can offer.

Here's what Westinghouse "Factory-Proved" Maintenance Service means in terms of *better* repairs, *longer-lasting* repairs:

EQUIPMENT of the most modern type has been used in the reconditioning and repair of the job.

FACTORY-PROVED METHODS and materials have been employed.

PERSONNEL trained in factory methods, supervised by men with years of experience, have performed the repair job.

ACCURATE TESTING—the repaired apparatus has been carefully tested to factory specifications.

SERVICE GUARANTEE—the repairs on the apparatus carry the standard Westinghouse guarantee.

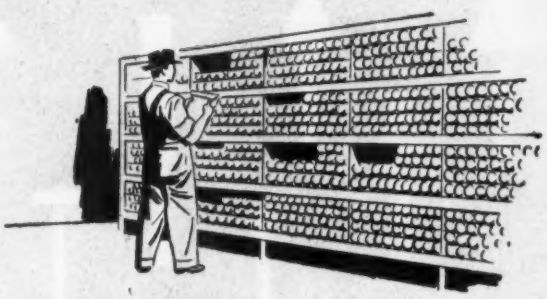
Westinghouse "Factory-Proved" Maintenance is a nationwide electrical repair service—with local branches as near as your telephone. Just call your nearest Westinghouse office, and explain the type of service you need. Westinghouse Electric & Mfg. Co., P. O. Box 868, Pittsburgh 30, Pennsylvania. J-96000

For Longer-Lasting Repairs Outside Your Plant

There is a Westinghouse repair plant near you to give you prompt "Factory-Proved" service on electrical repairs. Check the list on this page to see what "Factory-Proved" service means.

For Faster Repairs in Your Own Plant

. . use Westinghouse Field Engineering and Service. Factory-trained engineers are available to diagnose trouble, and work with your own people to speed up repairs. Portable field equipment assures accurate results.



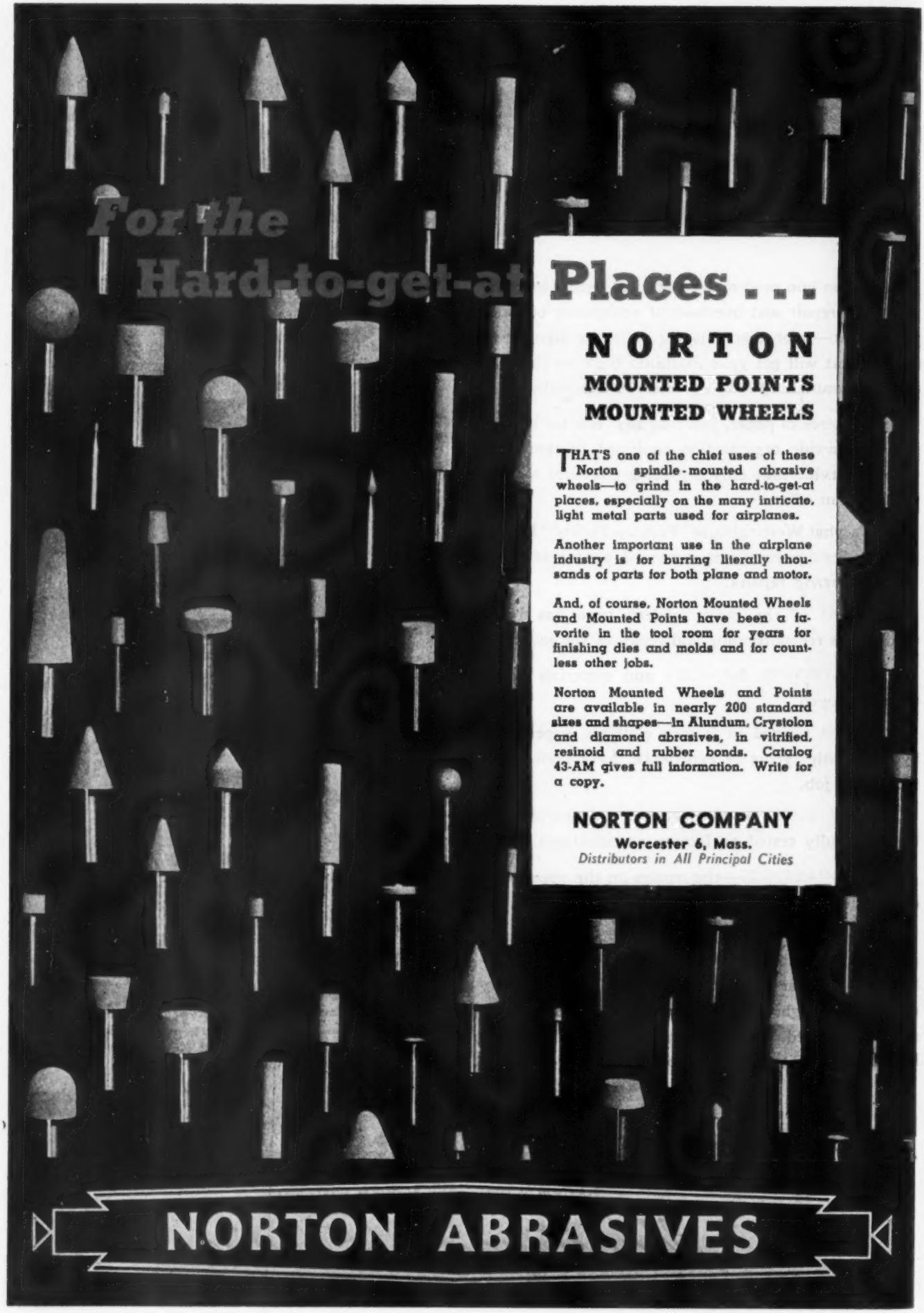
For Prompt Service on Renewal Parts

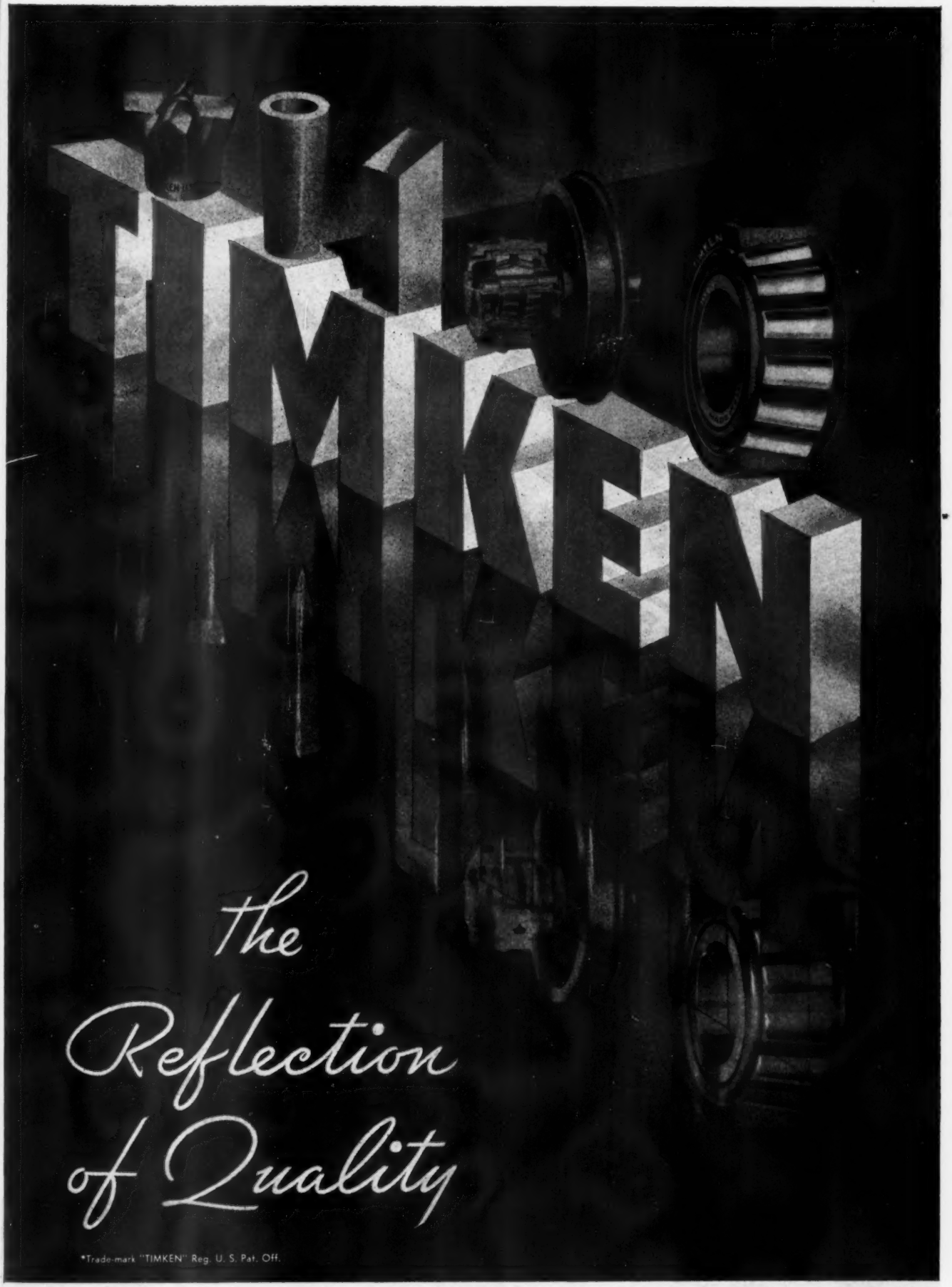
. . . call your Westinghouse District Sales Office. Ample stocks of genuine Westinghouse parts are available at all times. To speed minor repairs, build up your own stock of parts most subjected to wear.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Maintenance Service


For the
Hard-to-get-at Places . . .
NORTON
MOUNTED POINTS
MOUNTED WHEELS
THAT'S one of the chief uses of these Norton spindle-mounted abrasive wheels—to grind in the hard-to-get-at places, especially on the many intricate, light metal parts used for airplanes.
Another important use in the airplane industry is for burring literally thousands of parts for both plane and motor.
And, of course, Norton Mounted Wheels and Mounted Points have been a favorite in the tool room for years for finishing dies and molds and for countless other jobs.
Norton Mounted Wheels and Points are available in nearly 200 standard sizes and shapes—in Alundum, Crystolon and diamond abrasives, in vitrified, resinoid and rubber bonds. Catalog 43-AM gives full information. Write for a copy.
NORTON COMPANY
Worcester 6, Mass.
Distributors in All Principal Cities
NORTON ABRASIVES



TIMKEN Tapered Roller Bearings | TIMKEN Alloy Steels | TIMKEN Seamless Steel Tubing | TIMKEN Railway Roller Bearings | TIMKEN Rock Bits

WHETHER it's a single or multi-tipped tool, whether or not you have a print of the specific tool you need, Ex-Cell-O's Continental Tool Works Division can give you exactly what is required in a tungsten carbide application. . . . Write for Bulletin No. 11132.

EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH SHARPENING MACHINES • HYDRAULIC POWER UNITS • GRINDING SPINDLES • DRILL JIG BUSHINGS CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • FUEL INJECTION EQUIPMENT • R.R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • AIRCRAFT AND MISCELLANEOUS PRECISION PARTS

ROTARY FILES solve many a production-line problem of cleaning or smoothing out hard-to-get-at corners or surfaces. Dove-tailed surfaces, for instance, as exemplified in the above illustration. Here a Nicholson Inverted Cone Shape Rotary File with *Ground* teeth makes the operation quite simple and speedy. (The same shape is also available with *Hand Cut*, or conventional "file-type," teeth.)

16 NICHOLSON STANDARD ROTARY FILE SHAPES
in both Hand Cut and Ground types

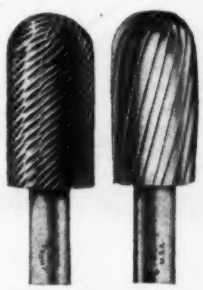
CYLINDRICAL FLAT END	BALL	INVERTED CONE
CYLINDRICAL RADIUS END	OVAL	CONE 60° INCLUDED ANGLE
TREE SHAPE RADIUS END	CONE	CONE 90° INCLUDED ANGLE
TREE SHAPE POINTED END	FLAME	CONCAVE TYPE I
CYLINDRICAL DOUBLE TAPER	BARREL	CONCAVE TYPE II
		BI-SHAPE (Concave-Convex)

Cuts — COARSE, MEDIUM, FINE. *Diameters* — 1/8" to 2"

NICHOLSON FILE COMPANY • 97 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

WRITE FOR CATALOG AND PRICE LIST

and for any desired special information. For deliveries, consult your mill-supply house.

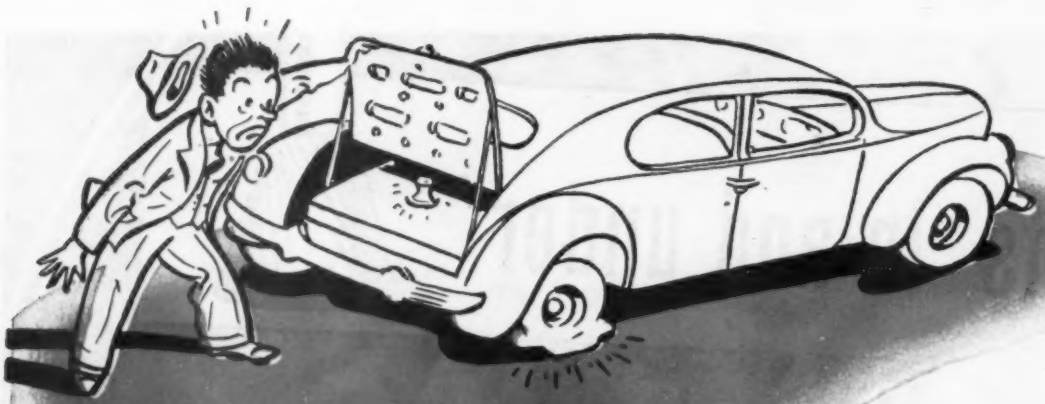


HAND CUT GROUND

NICHOLSON ROTARY FILES

HAND CUT AND GROUND—FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U.S.A.



WOULD YOU DRIVE WITHOUT A *Spare?*

"Just my luck! A flat tire and no spare! What a predicament!"

A machine shop foreman may be in a worse predicament without a spare arbor. When an arbor breaks, production ceases until the arbor is replaced. Machine and manpower hours wasted! Schedules disrupted! Deliveries delayed! That's why we say —

It Pays to Have Several Arbors in Stock

Arbors are "perishable tools" and today their cost is relatively small in comparison to lost hours and disrupted schedules. So play safe! Order your spare arbors today. Remember, Kempsmith Arbors are now available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle.

THE KEMPSMITH MACHINE CO. • 1821 S. 71st Street • Milwaukee 14, Wisconsin

Get Your Copy of this NEW ARBOR BULLETIN

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.

Arbors BY KEMPSMITH

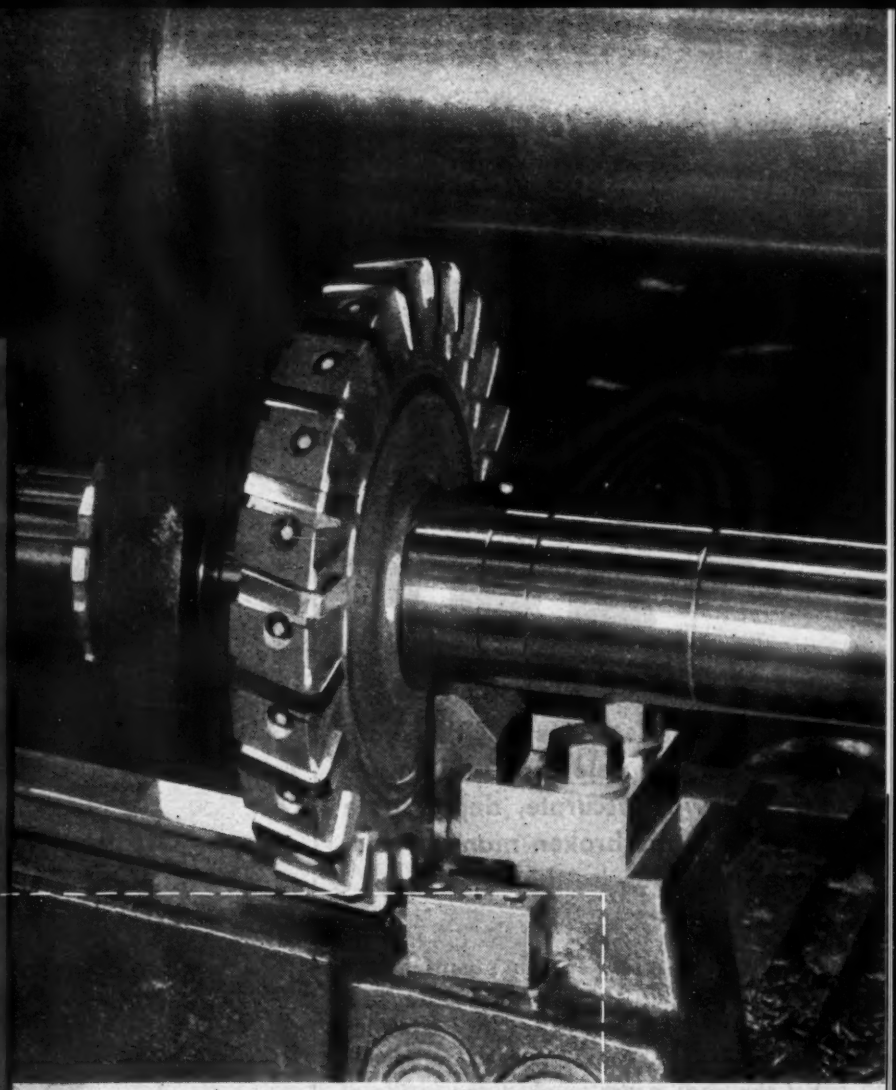
Precision Built Milling Machines Since 1888

Write Today!

KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME..... TITLE.....

FIRM..... ADDRESS.....



WHEREVER METAL IS MILLED THEY SAY—

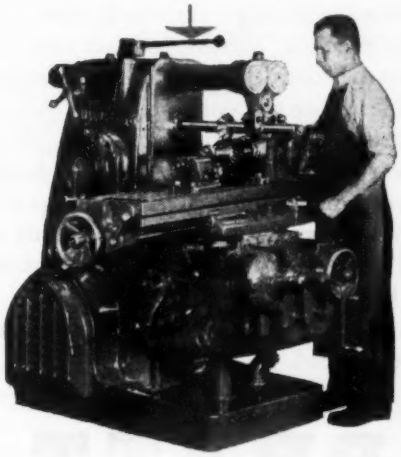
"PUT IT ON A *Milwaukee*"

For SPEED PRECISION PROFIT

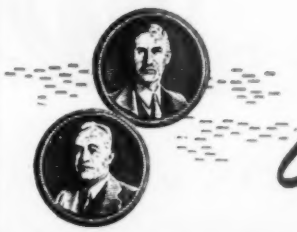
A special inserted blade side-milling cutter, mounted on a Milwaukee Style B Arbor, is milling this work-piece held in a special fixture clamped to the table of a Milwaukee 3K Milling Machine.

Yes — wherever metal is milled in the tool-room or experimental laboratory, on the production line — Milwaukees rank "tops" as the performers — the machines that get the work done with speed — precision — and profit. In fact when the job is a bit difficult or involved experienced machine-shop men usually say: "Put it on a Milwaukee"!

The next time you need milling equipment consult with a Kearney & Trecker field engineer. He will explain why you can effect sustained precision performance through the years with Milwaukee — the powerated milling machines — engineered and built in keeping with their rated motor hp.



Standard models — horizontal, vertical and bed types — in motor ranges 3 to 25 hp; C.S.M. (Carbide Steel Milling) machines 20 to 50 hp; special machines in a wide range of sizes, types, motor hp. *Write for complete information.*



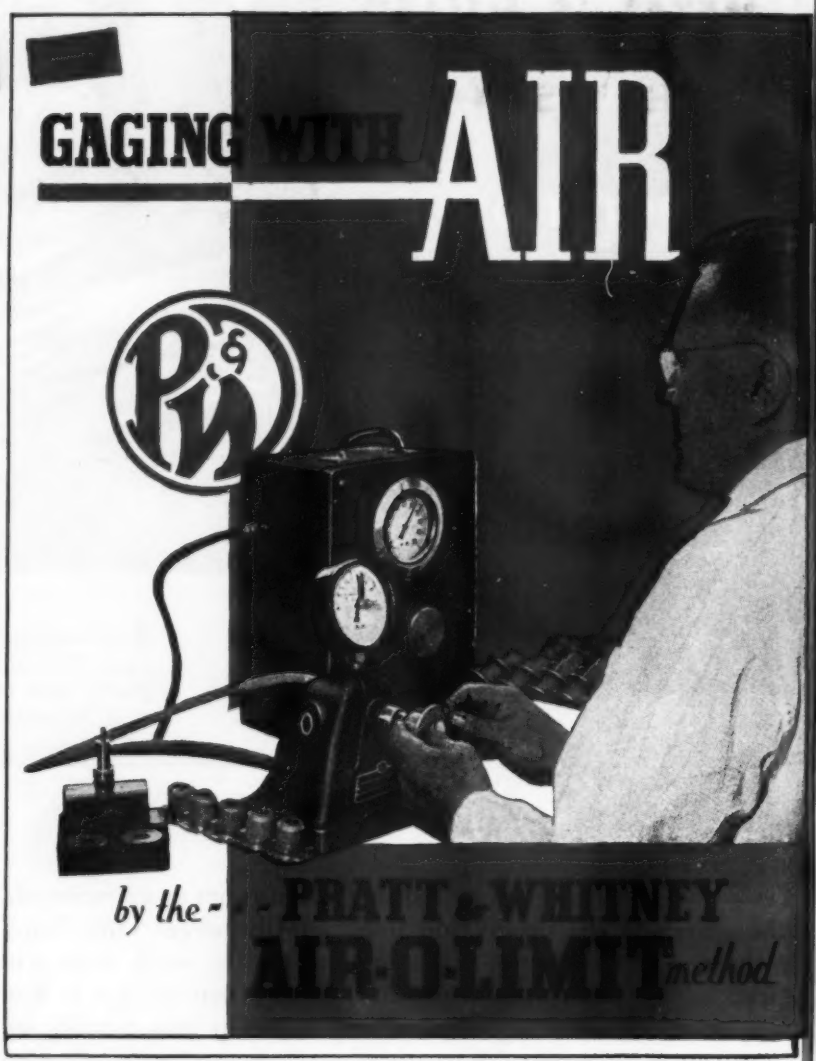
KEARNEY & TRECKER CORPORATION

MILWAUKEE 14, WISCONSIN

Milwaukee Machine Tools

LATEST INFORMATION

on the P&W Air-O-Limit Internal Comparator



New free bulletin just off the press gives you complete facts and figures on this swift, accurate, dependable gage that has broken many a war-time production bottleneck.

AN AIRPLANE engine manufacturer speeded up the I. D. inspection rate of his master-rod bearings by 500% with the P&W Air-O-Limit Internal Comparator. *Yet the gage never touched the inside of the bearing!* That's because the Air-O-Limit gage works on the "air gap" principal . . . compressed air is forced through tiny nozzles at the end of a spindle, and when the bearing is slipped over the spindle the back pressure of the compressed air is registered on a precision pressure indicator calibrated to read in "tenths." Other Air-O-Limit models omit this non-touching feature, but operate on the same principle. All of them have been doing a man-sized job on the war production front and will keep right on giving swift, accurate readings as industry swings over again to peacetime output. This newest bulletin has the complete Air-O-Limit story from A to Z . . . it is free to any executive who requests it on his letterhead.

Write for this new bulletin.

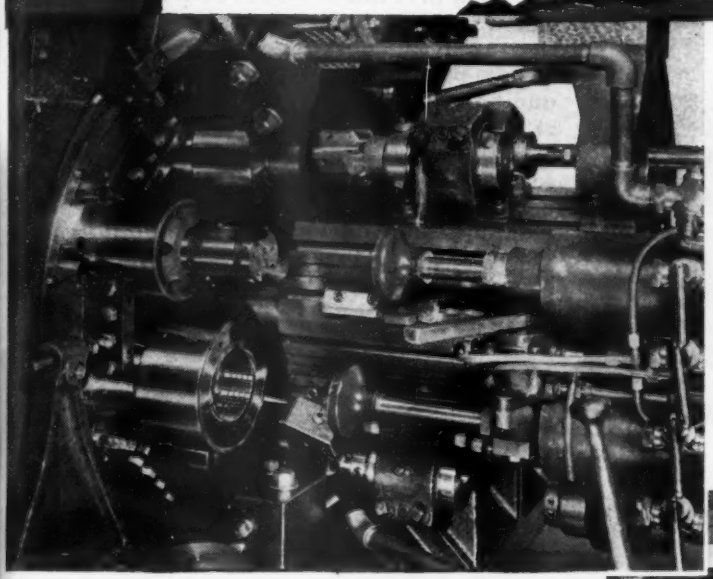
PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

WANTED:

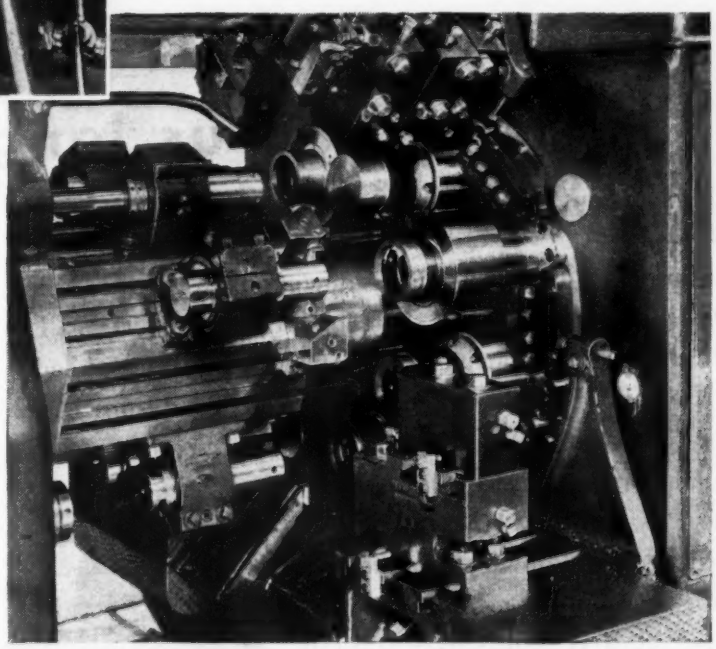
A Machine that can work with 15 tools at the same time



If you want to run an ad like that, here is an applicant for the job.

It's an Acme-Gridley Chucking Automatic —a machine built for one reason, to cut costs by turning out more precision work in less time.

Large, accessible tooling area permits use of more tools working together, with sustained accuracy at high speeds. Efficient chip removal, less operator fatigue. Multiple tooling combines operations—saves time, saves tools, saves floor space, saves investment.



Here is the 15-handed machinist at work. The job—machining an annealed cast-iron motor piston, on a 6″ 8-spindle Acme-Gridley Chucker.

First operations (shown here) 15 tools, double indexing, with alternate internal and external chucking, permits rough finishing both ends at one setup.

Second operations, 14 tools, double indexing and multiple tooling finishes two pieces at same time.

29 tools required, only two setups needed.

Write us about your chucking jobs. We'll help you get the costs down.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

BEARINGS BEAR UP

Powered by Tri-Clad sleeve-bearing motors, this battery of milling machines has been in round-the-clock operation on war work since before Pearl Harbor. The short-center, hinge-base drives put a hard, steady pull on the motor bearings. In addition, the machines are in the hands of several different operators each day, many newly trained. Despite the severe service, motor-bearing performance has been above prewar levels. Maintenance manpower has been conserved, and production held on schedule.

Tri-Clad motors driving milling machines in the River Plant Division of the Savage Arms Corp., Chicopee Falls, Massachusetts.

How torture tests on TRI/CLAD bearings have helped us lengthen motor life

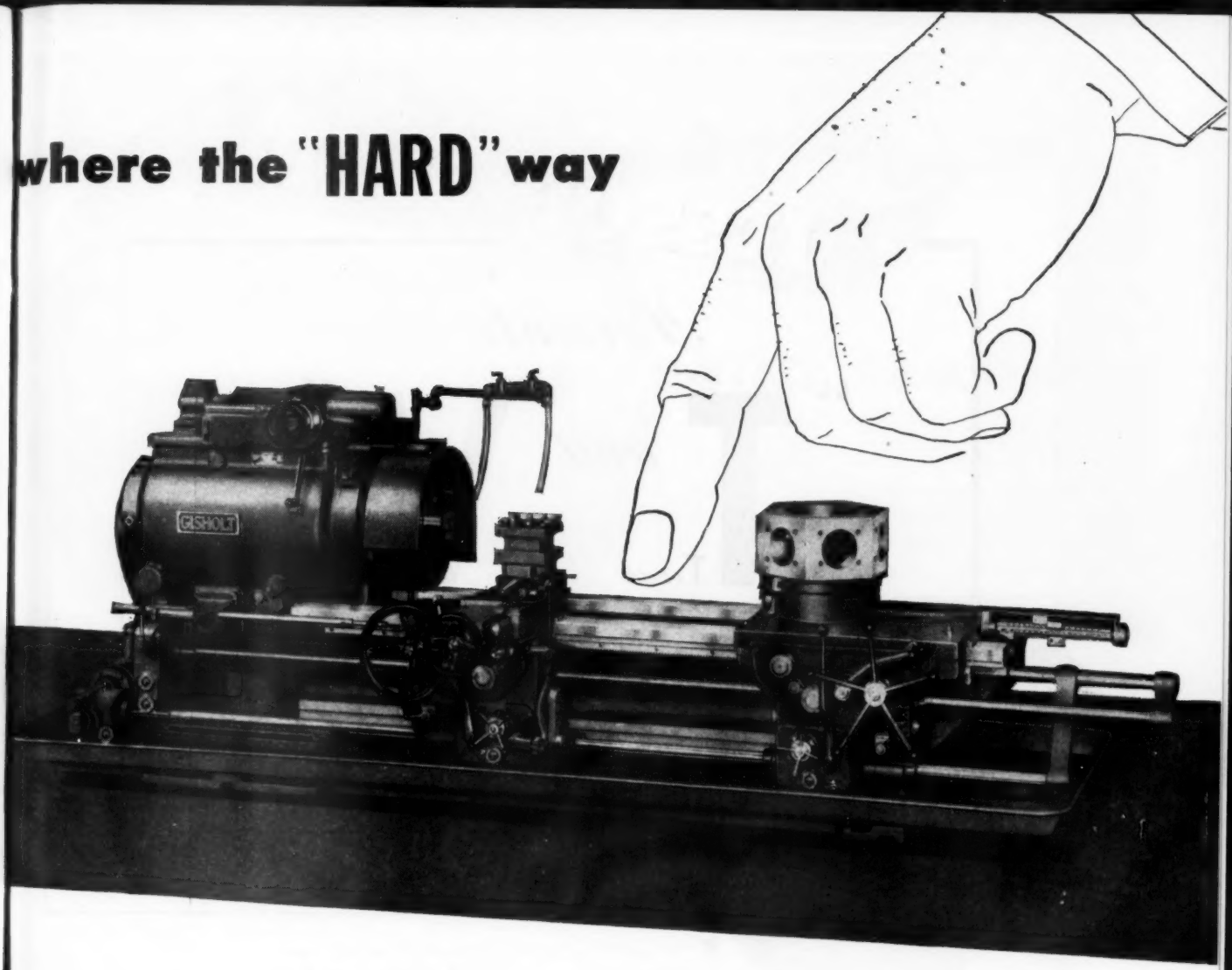
Before the Tri-Clad motor-bearing designs were adopted, many models of this new motor were tested to destruction under heavy shaft loadings applied from all directions, with various kinds of lubricants, and under many different speed and temperature conditions. As new Tri-Clad types are introduced, these tests continue—some for years—in "torture" areas such as shown at right. Each test broadens our knowledge, offers new clues to longer motor life. Throughout industry, results have substantiated the improved bearing performance forecast by these tests. *General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

TRI/CLAD MOTORS

Buy all the BONDS you can — AND KEEP ALL YOU BUY

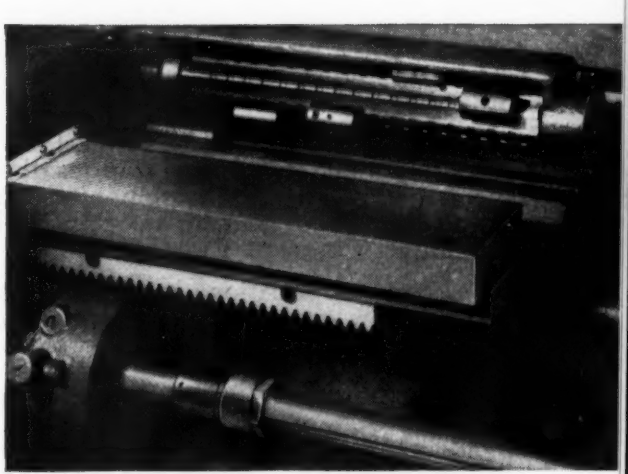
where the "HARD" way



is the RIGHT way!

There is no substitute for *hard* steel on the ways of a turret lathe. That's why Gisholt does it *right* . . . makes its bedways of steel, hardened to 63-65 on the Rockwell C scale.

That's why Gisholt's ways can't be battered by heavy work or scored by hard, tough chips. Straddle-keyed their entire length, bolted to bedways from the under side, and finish-ground in exact alignment with the spindle, Gisholt's hardened-steel ways provide bearing surfaces that are virtually wear-proof. They insure the high standard of accuracy for which Gisholt is known —and maintain it through long years of service.



Gisholt's thick, block-type ways are hardened on all surfaces: (1) top *to support weight of carriages and cutting pressure of tools,* (2) both sides *for alignment and gibbing, and* (3) *for* bottom *gibs and clamps. Automatic pressure lubrication eliminates any tendency to wear, even in areas of heaviest carriage travel.*

GISHOLT MACHINE COMPANY
1201 East Washington Ave. • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With
Gisholt Improvements in Metal Turning

GISHOLT

URRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

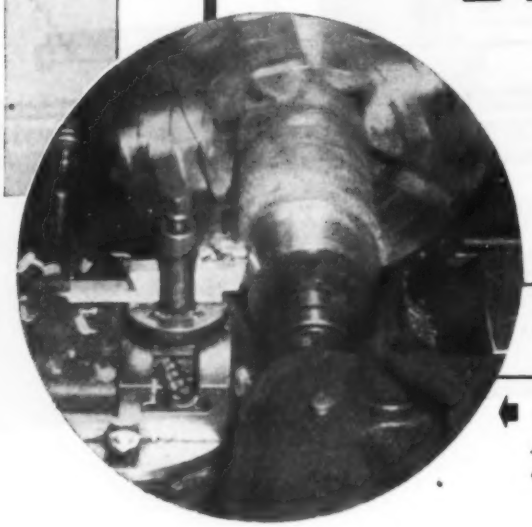
JESSOP STEEL

Presents

"T and V"

Tough *Versatile*

AN IMPROVED CUTTING ALLOY



"T and V" operating at a speed of 284 r.p.m. Apron feed is .0174" and depth of cut is ⅛" on 18-8 forged round 5" in diameter.

★ To the already diversified line of cutting tools marketed by Jessop, an improved type cutting alloy has been added.

Known as "T and V", it is a cast, non-ferrous alloy that effectively bridges the gap between high speed and cemented carbide cutting tools, and is made up principally of Chromium, Tungsten and Cobalt.

On many applications where high speed tools are now generally used, this improved alloy tool has proven that increased feed, speed and depth of cuts are possible. Peak efficiency is realized when cutting at speeds of 20% to 80% over the top speeds for high speed tools. Even intermittent cutting of chilled castings is possible due to its inherent toughness.

The hardness range of "T and V" is from 60 to 62 Rockwell C. Exceptionally high red-hardness is shown by the tool inasmuch as only one point drop in Rockwell C is noted at temperatures ranging as high as 1900°F. The improved tool is cast to shape and is used in the "as cast" condition, other than being surface ground. It differs from high speed steels in that it cannot be hot worked and is not susceptible to heat treatment.

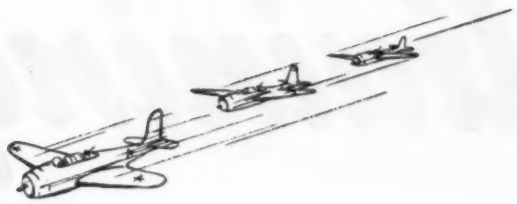
"T and V" is available in plates and squares for tool holder bits or for milling cutter inserts, surface ground to tolerances of +.000" and −.005".

Jessop Steel representatives will be glad to consult with you regarding "T and V" for your particular requirements.

Established 1901

JESSOP STEEL COMPANY

Head Office and Works:
WASHINGTON, PENNA.



PINPOINT REAMING

The patented Lempco Dual-Spiral Hi-Speed Steel Expansion Reamer is fast, accurate, and economical. 500% greater expansion range, plus the fact that removable blades may be re-sharpened 8 to 10 times, enables one Lempco Dual-Spiral to ream as many different size holes as 6 to 8 conventional expansion reamers. It eliminates honing, and the costly wear on plug gauges caused by abrasive left by honing. It reams smoothly over keyways and split bushings. Extension pilots are available for alignment jobs.

SPECIAL REAMERS DESIGNED TO MEET YOUR NEEDS SEND BLUEPRINTS

2-WAY FLUTES...

spiral in opposite directions simultaneously, effecting a clean, shearing action that finish-reams holes mirror-smooth. Equally efficient on any machinable metal or fibrous plastic. Blade segments are removable and economically resharpened. Good delivery.

BOXED SETS

with dimensional range from .495" to 1.295". Covers needs of most die, tool and maintenance shops. Set No. JR pictured shipped complete with pilots in fitted hardwood chest. This set of 6 has an expansion range equal to 30 ordinary spiral reamers.

WRITE FOR CATALOG

LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

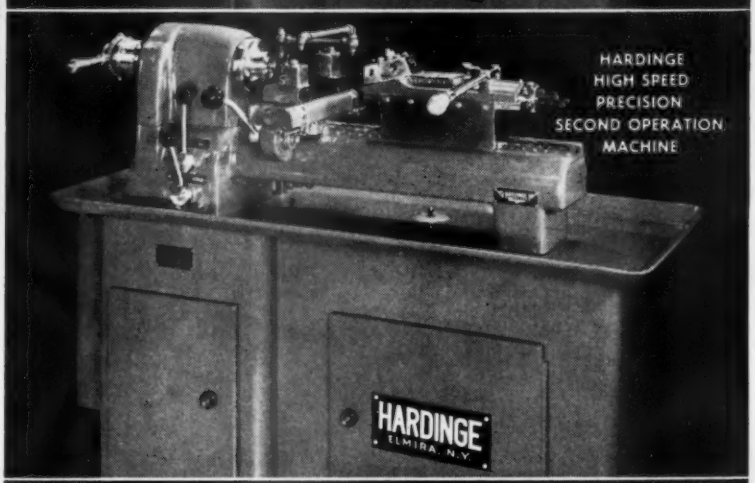
Gaining Ground

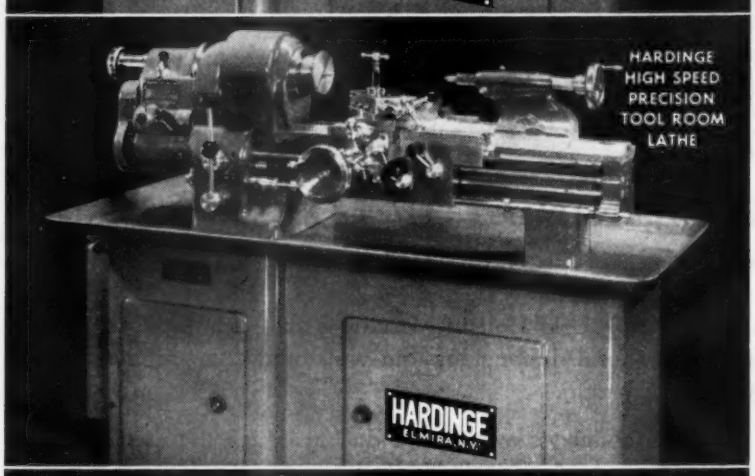
GENERAL MACHINERY CORPORATION

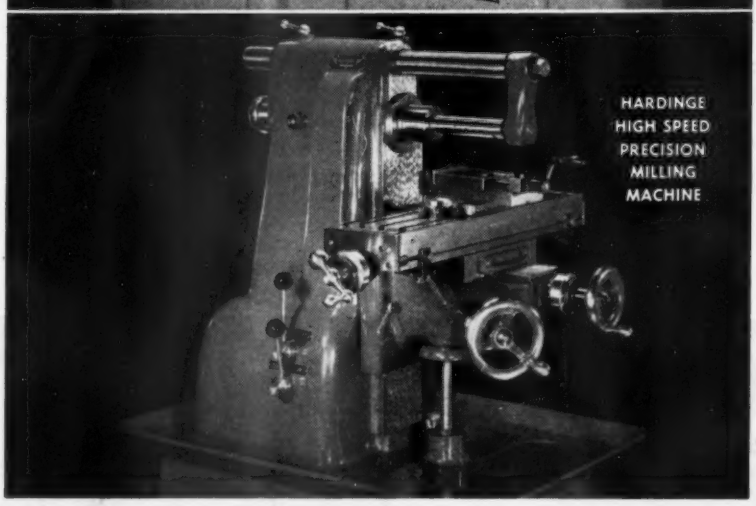
GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS COMPANY • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION







HARDINGE
ELMIRA, N.Y.

Matched machines for high speed performance

These matched high speed precision machines have a place in your planning . . . present and future . . . because you are always interested in higher speeds, extreme lasting accuracy and simplicity and ease of operation. Complete specifications and typical price quotations upon request. Ask for complete bulletins.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

SPECIFICATIONS

High Speed Precision Lathe: 1" collet capacity, 9" swing, 17" center distance, eight spindle speeds up to 4000 R.P.M.

High Speed Precision Toolroom Lathe: 1" collet capacity, 9" swing, 16" center distance, sixteen spindle speeds from 27 to 1750 R.P.M.

High Speed Precision Second Operation Machine: 1" collet capacity, 6" step chuck capacity, 5" jaw chuck capacity, 9" swing, eight spindle speeds up to 4000 R.P.M.

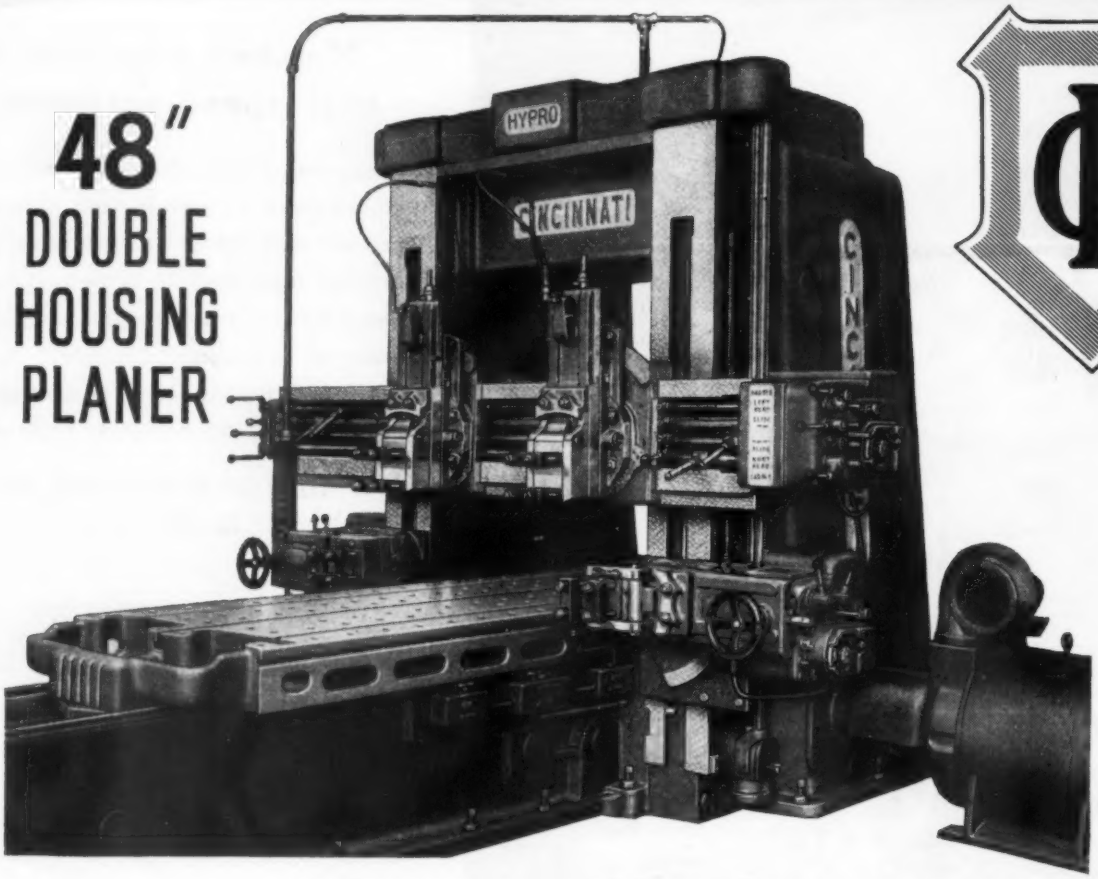
High Speed Precision Milling Machine: 1" collet capacity, 14" longitudinal, 13¼" vertical, 5½" transverse travel, eight speeds from 110 to 1850 R.P.M. TM model for plain milling, UM model for spiral milling.

All machines illustrated have the Hardinge Precision Preloaded Ball Bearing Spindle Construction

"Performance has established leadership for HARDINGE"

CINCINNATI HYPRO

48" DOUBLE HOUSING PLANER



BETTER PLANING FOR LESS COST
At speeds up to 300 feet per minute

This newly designed Cincinnati Hypro Double Housing Planer is just as sturdy as it looks. Its massive pyramid housings, its liberal dimensions and well built components assure the rigidity necessary for accurate planing.

This 48" planer is the product of half a century's experience during which the metal working industry elected us by their patronage America's leading planer manufacturer.

Skill learned by our veteran craftsmen in building 7000 machine tools contributes fine workmanship to each new Hypro Planer.

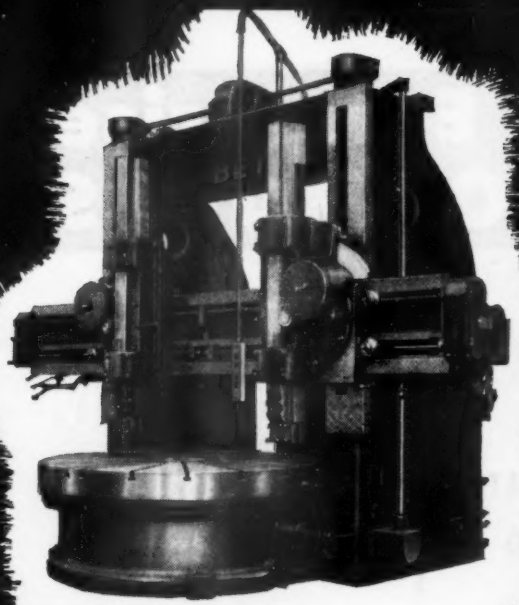
Our engineers have added to the time tested Hypro-duction features many patented improvements that increase Cincinnati Planer accuracy, smooth flowing power and ease of control.

Write for Bulletin 136 illustrating Hypro Planer advantages

THE CINCINNATI PLANER COMPANY

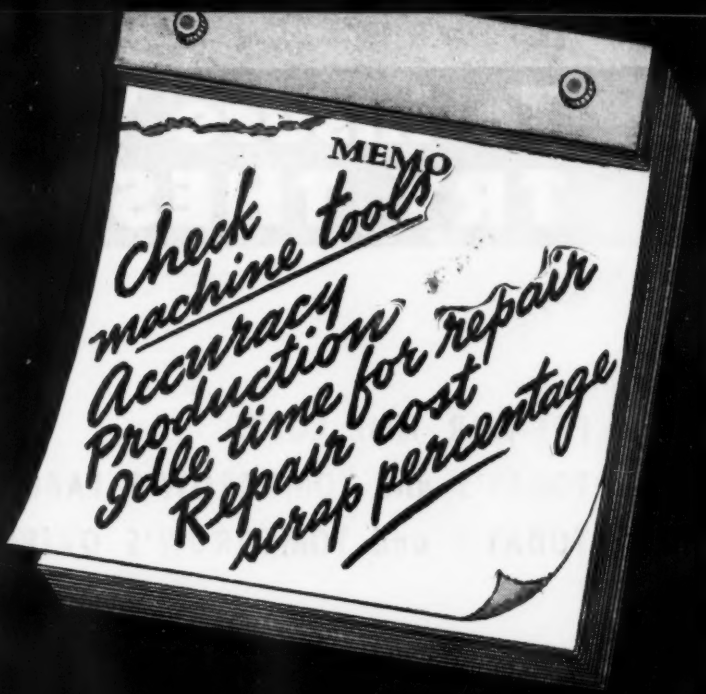
Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.



BETTS 100"
VERTICAL
BORING AND
TURNING MILL

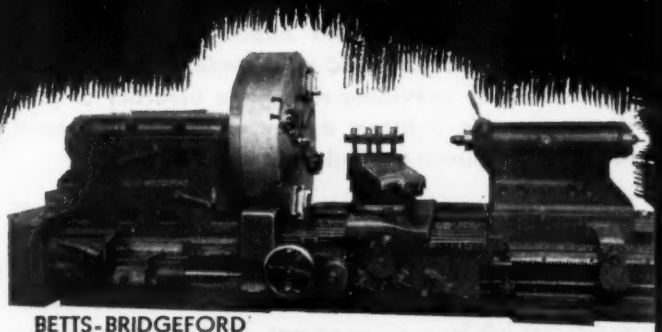
BETTS 48"
HEAVY DUTY SLOTTER



IS OLD AGE CATCHING UP WITH YOUR MACHINE TOOL EQUIPMENT?

Be prepared to meet post-war as well as war conditions on a sound competitive basis. Investigate Consolidated heavy machine tools . . . machines designed and built for greater, lower-cost production.

BETTS 11'-6"x11'-6"
HEAVY DUTY PLANER



BETTS-BRIDGEFORD
60" HEAVY DUTY GEARED HEAD LATHE

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

To Insure Your Enterprise TRY THESE FORMULAS

PRE-WAR TIME COSTS
TODAY'S and TOMORROW'S LABOR RATES
TODAY'S and TOMORROW'S OVERHEAD
= PROHIBITIVE SELLING PRICES

OR

NEW, MORE PRODUCTIVE TIME COST
TODAY'S and TOMORROW'S LABOR RATES
TODAY'S and TOMORROW'S OVERHEAD
INCREASED QUALITY.
= PROFITABLE POST-WAR SELLING PRICES

RING GAGE ACCURACY AT PRODUCTION RATES BY

MICROHONING

Microhoning offers to industry a new tool with which to meet post-war demands for better products at moderate cost—at possibly increased labor rates. A process of final machining, **Microhoning now assumes added responsibility—it removes from .010 to .030 stock under automatic sizing control. By providing ring gage accuracy *at production speeds*, it offers a way of using the second formula to achieve profitable post-war prices.**

It will correct error in bores, or on cylindrical or spherical surfaces, either before or after heat treating—providing form and size accuracy to "tenths." In removing stock, it does not cause heat cracks. By removing distorted surface metal and cracks left by previous operations, it eliminates two of the most frequent causes of fatigue failure.

This modern abrading process also provides any desired surface finish. It is not limited in its application to iron and steel products, but is in successful operation on a wide variety of non-ferrous metals, such as silver-lined bearings and chromium-plated cylinder bores.

Micromatic Hone Corporation builds machines for Microhoning as required in industrial production. These range from tool room type machines arranged to handle a wide variety of work to multiple spindle production machines which provide accuracy and high speed on production parts.

Microhoning can be very useful in your post-war production. Let our engineers discuss applications with you.

MICROMATIC

MAKERS OF

New MICROMATIC HYDROHONER MODEL 705

MULTIPLE SPINDLES

AUTOMATIC ROTARY INDEXING

MICROSIZE CONTROL

MICRODIAL FEED CONTROL

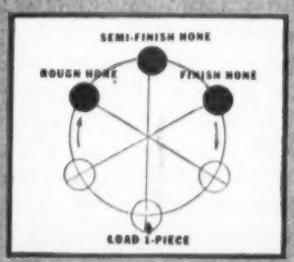
This new Micromatic Hydrohoner is a high speed production model, designed to produce large quantities of high precision parts. It may be used in multiple or progressive honing within uniform size limits (maximum) of .0003", on parts such as these:

Diesel Fuel Injectors, Pinion Gears, Precision Bearings, Bushings, Compressor Housing Bores, Piston Pin Holes, Connecting Rods, Valve Guides, Hydraulic Pump Bores, Rocker Arms, Ceramic Tubes, Valve Bodies.

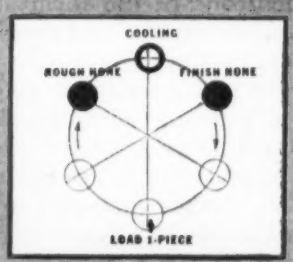
Variations in error which usually occur in production are corrected in straight run honing. Uniform size is automatically generated through the Micromatic Microsize Control—a positive, fully automatic method of generating uniform size.

Each spindle has its own individual Microsize Control, so that any desired combination in multiple or progressive honing may be set up.

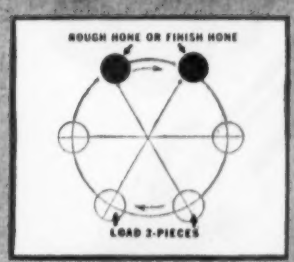
Three typical set ups are illustrated below:



THREE OPERATIONS. Progressive Honing Operations permit maximum stock removal per unit of time. Usually recommended for maximum stock removal ranging from .007 in ¼" diameter bores to .010 in 1" diameter bores.



TWO OPERATIONS. Progressive Honing Operations permit medium amount of stock removal per unit of time. Usually recommended for maximum stock removal ranging from .0035 in ¼" diameter bores to .005 in 1" diameter bores.



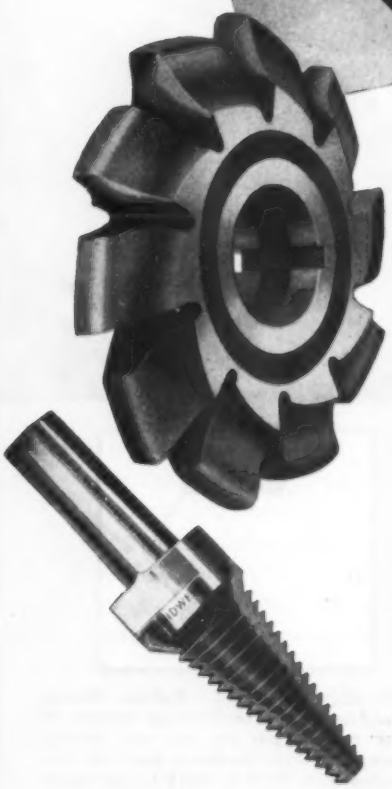
ONE OPERATION. Multiple Honing Operation permits conventional amount of stock removal per unit of time. Usually recommended for maximum stock removal ranging from .0005 to .0015 for hardened parts (55 Rock. C or harder), .001 to .003 for soft or medium hard parts, in bores from ¼" to 2" diameter.

HONE CORPORATION DETROIT 4, MICHIGAN

HONING MACHINE TOOLS

MIDWEST FORM RELIEVED CUTTERS

are economical when you have to mill intricate shapes and outlines



WHEN CONSIDERING FORM CUTTERS, NOTE THE FOLLOWING:

There are an infinite number of shapes, both symmetrical and irregular in outline, which can be milled efficiently and economically with Midwest Form Relieved Cutters. These cutters, provided with eccentric relief behind the cutting edges, always maintain the original outline of form when they are sharpened by grinding the faces of the teeth. However, conditions are so varied in the application of form cutters, no definite rules can be offered for making a proper selection as to type and form. When considering form cutters, send a blueprint of part to be milled; outline the cutter on the surface to be milled; furnish all dimensions of the form shown, with tolerances; specify arbor diameter, keyway size, and rotation. On unsymmetrical forms, designate below the outline, rotation, as "bottom going" or "bottom coming." Whenever possible, form cutters should have undercut teeth, the degree depending upon operating conditions. When sharpening a form cutter, the amount of undercut which is marked on the cutter should be preserved, since the form was corrected for this exact amount of rake . . . Other examples of Midwest Form Relieved Cutters may be found in Midwest's catalog 17 of Precision Metal Cutting Tools.

Your Security and Freedom depend on your Country Winning the War. There is no alternative. Your Country needs your Fighting Dollars for Victory. Invest them Now in United States Bonds and Stamps.

END MILLS • SLEEVES • COUNTERBORES • SPECIAL TOOLS • DRILLS
REAMERS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

MIDWEST TOOL & MFG. CO., 2356 W. JEFFERSON AVENUE, DETROIT 16, MICH.

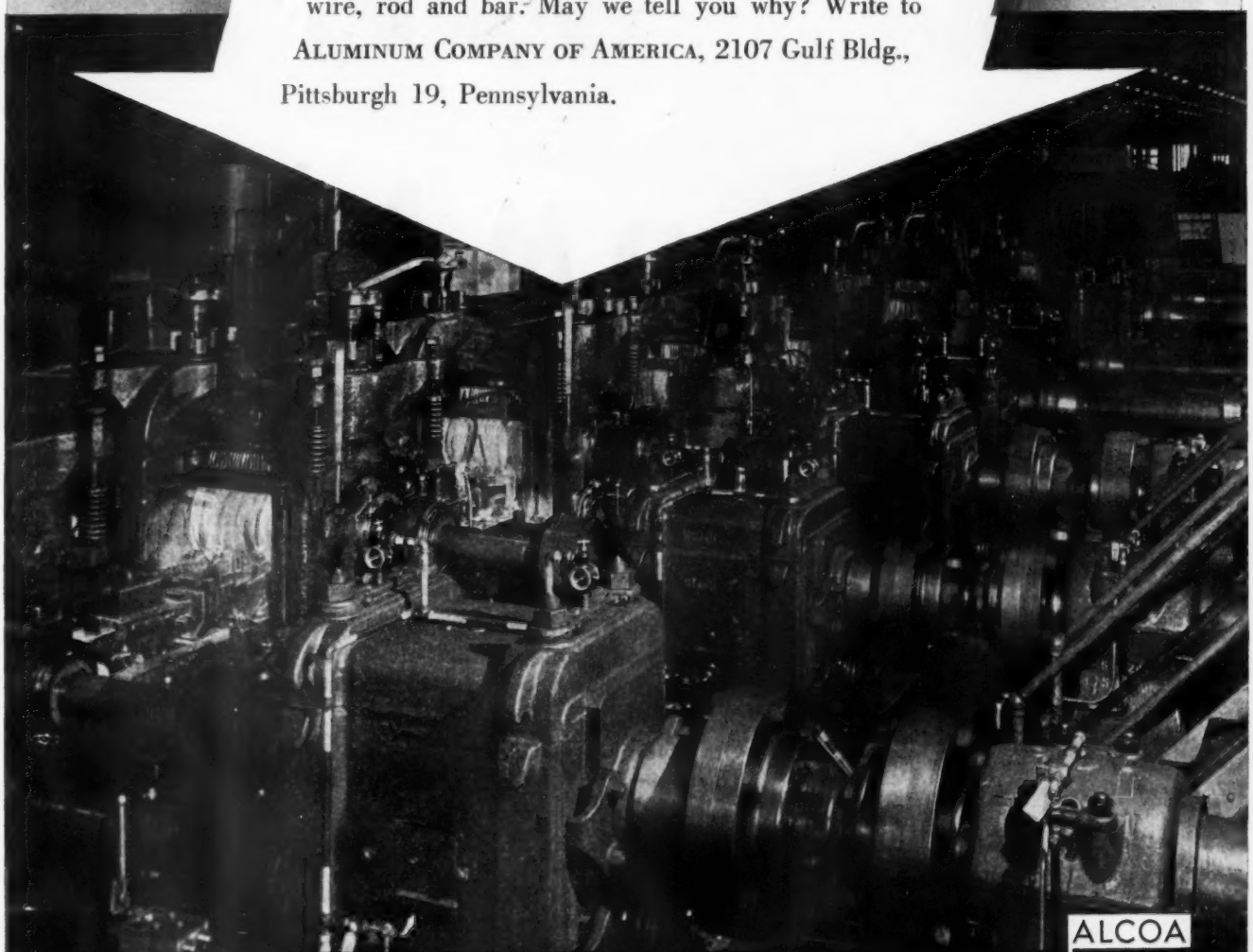
MIDWEST *Precision* METAL CUTTING TOOLS

This rolling mill is evidence of Alcoa's faith in the future for Aluminum Wire, Rod and Bar

Started as a prewar project, this rolling mill at Alcoa's Massena, New York, plant was rushed to completion to make it available for war production. Aluminum alloy rod and bar stock rolled here has been an important contributor to the war effort.

As wartime demands slack off, the production of this mill will be available to those manufacturers who plan big things with aluminum postwar.

Alcoa has great faith in the future for aluminum wire, rod and bar. May we tell you why? Write to ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pennsylvania.



ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

PAST PERFORMANCE

...a safe guide for "The Tools You Buy Again"

Actual results — in terms of better, faster, more economical work—make standardization on UNION TOOLS a logical procedure and a sound policy. Years of specialization in development and manufacture has enabled UNION to produce long-lived, dependable small tools — tools that help keep production moving at maximum speed and accuracy at a minimum of expense.

Once you've put UNION tools to work, they'll be the "Tools You Buy Again." Performance will have been the basis for your choice.

UNION TWIST DRILL CO.
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

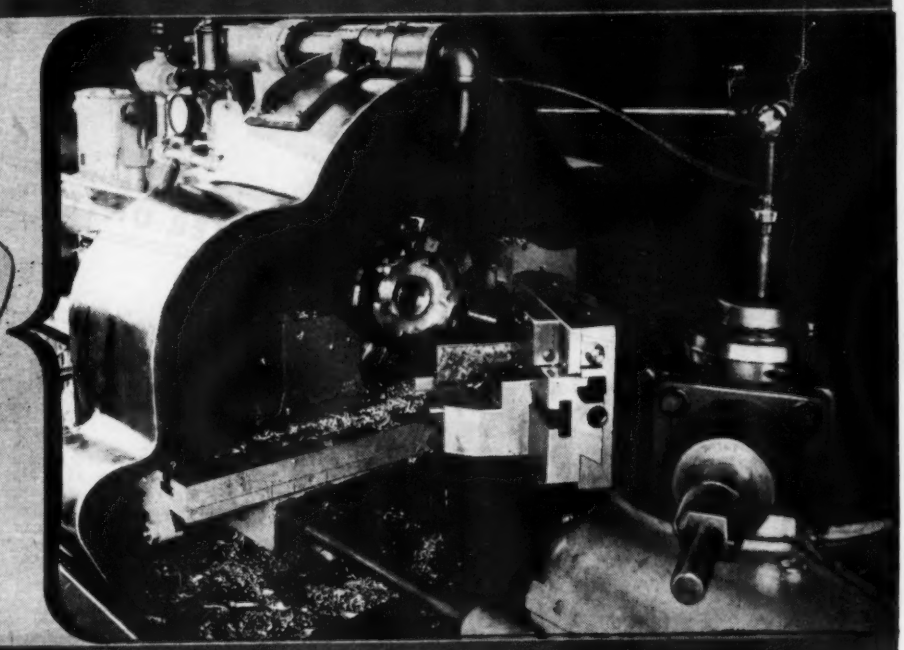
THE UNION LINE

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

UNION

Now's the time to look into the Retooling Possibilities--of your P & J EQUIPMENT...

BEARING CAPS TODAY—but SOMETHING ELSE TOMORROW



Probably most P & J machines on war work today will soon have other jobs to handle. The type 4D H.S. P & J Automatic is no exception. As shown here it is busy turning out bearing caps in a nationally-known shop, maintaining close tolerances, keeping costs down and holding to fast production schedules.

This machine, however, is not shackled to the work it is doing. It can be readily changed over for the production of other parts by the comparatively simple procedure of re-tooling, with all original speed, convenience and accuracy retained.

Your P & J equipment can also be converted to other use. P & J engineers, with their long specialized experience in tooling, can help you extend the utility of your machines. Why not find out immediately just what the possibilities are and how you can take advantage of them. Outline your problem and ask for our recommendations.

The POTTER & JOHNSTON MACHINE CO.
PAWTUCKET, R. I.

P & J REBUILDING
Service

P & J offers complete facilities in its shop for thorough rebuilding of customers' P & J Automatics. This service assures restoration of machines to original productivity and accuracy. Retooling can also be handled at the time of rebuilding.

IT'S THRIFTY — *and* PATRIOTIC — *to save with* BONDS . . .

Design FOR

XLO

EX-CELL-O *for* PRECISION

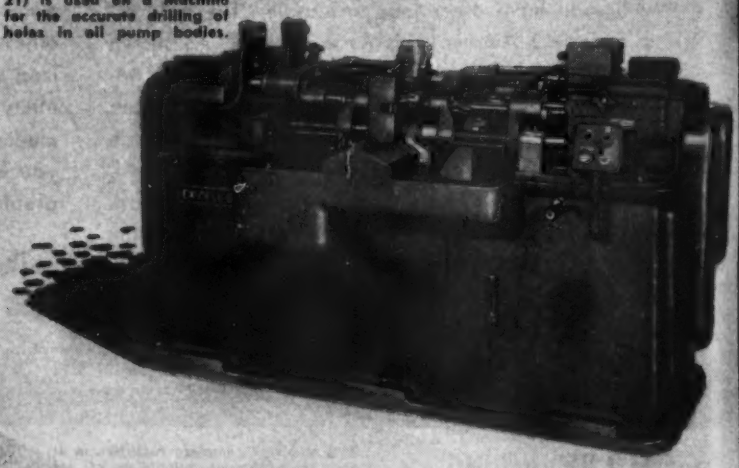
EX-CELL-O HYDRAULIC POWER UNIT

STYLE 28-A

Below: Here is an Ex-Cell-O machine, used for a semi-finish boring job on an aircraft crankcase section. A 10-horsepower Ex-Cell-O Hydraulic Unit (Style 28) drives an Ex-Cell-O multiple drilling head.

To right: On this Ex-Cell-O double drill press, two Style 25-A Ex-Cell-O Hydraulic Units are mounted on the columns in vertical position. This positioning of the units has definite advantages on certain classes of work.

Below: Here is shown an instance where the Ex-Cell-O Small Hydraulic Unit (Style 21) is used on a machine for the accurate drilling of holes in oil pump bodies.

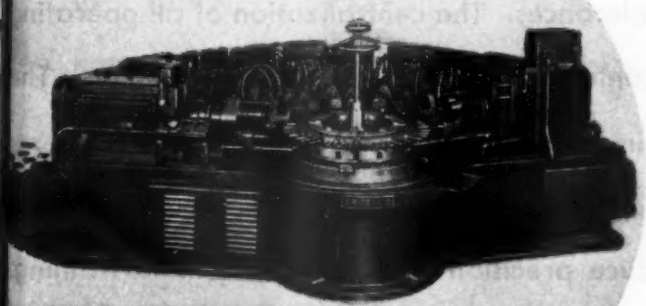


Where high production, accuracy, and economy through multiple operations are required, consult EX-CELL-O

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH SHARPENING MACHINES • HYDRAULIC POWER UNITS

ECONOMICAL PRODUCTION!

Production machines equipped with Ex-Cell-O Hydraulic Units have many advantages



Above: Nine Ex-Cell-O Hydraulic Units (Style 25-A) mounted around an automatic index table, each unit carrying a two-spindle multiple head. All units operate simultaneously but have individual adjustment for setting up.

For the machine you build, or the machine we build, the use of Ex-Cell-O Hydraulic Power Units provides these features:

They are compact, for proper design.
They are self-contained, for ease in installation.
They have infinite feeds, for proper cutting.
They have gear change, for proper speeds.
They have ample power, for multiple-head operation.
They have variable stroke, for greater flexibility.

Ex-Cell-O Hydraulic Power Units are standard and produced in quantities, but in nearly every case where the unit is used it becomes a part of a special, high production type machine for a specific operation. These units are economical because, as applications change, the units can become a part of the new machine even though entire base is redesigned.

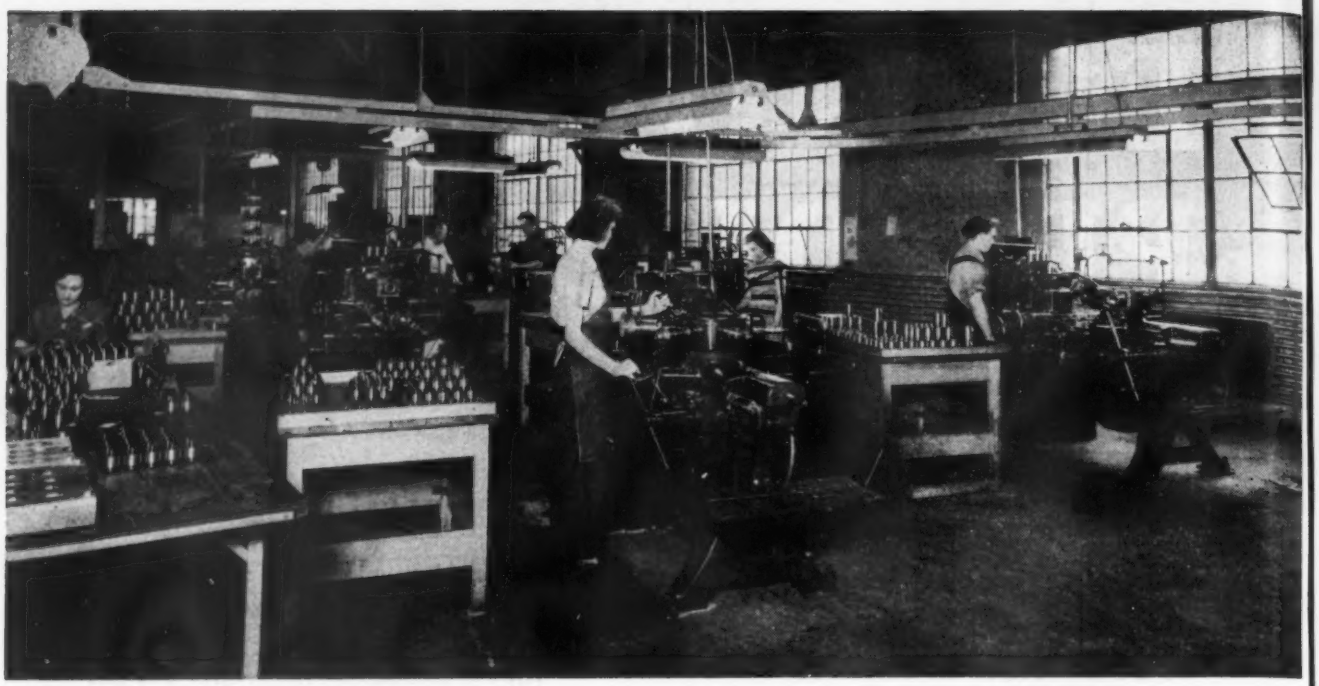
The illustrations on these pages show typical applications where these Ex-Cell-O units have become a part of high production machines built by Ex-Cell-O. The units can be mounted on any plane —horizontally, vertically, or angularly—on a temporary or a permanent base, and they can be arranged so that it is possible to use them in connection with guide bars and multiple drill heads.

Find out today how Ex-Cell-O Special Machines and Ex-Cell-O Hydraulic Power Units can fit your program for today's and tomorrow's production.

EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • AIRCRAFT AND MISCELLANEOUS PRECISION PARTS



This battery of ACME TURRET LATHES MEET DEMAND FOR HIGH PRODUCTION

★

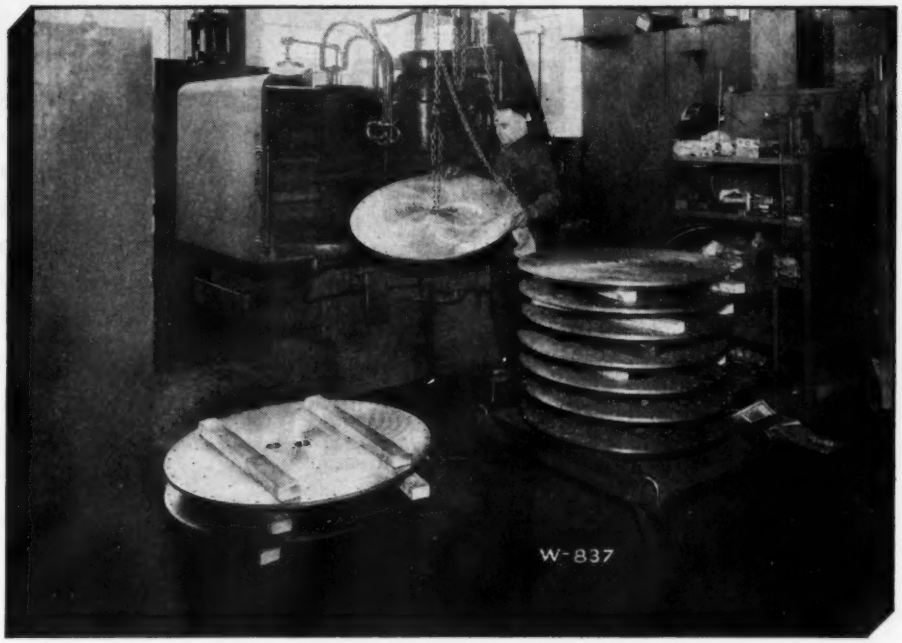
● For jobs such as these, shops use Acme Turret Lathes exclusively on high production war work. The sturdy, rigid, construction of the machine assures strict adherence to precision tolerances. The centralization of all operating controls makes for fast, easy operation. The simplicity of operation enables women operators to handle the machine with ease and produce precision work with very little training. The parts shown around the various machines are completely finished on this battery of Acme Turret Lathes. For power — precision — speed and flexibility, put your next job on an ACME.

The ACME MACHINE TOOL CO. ... CINCINNATI 32, OHIO.

"Put it on the Blanchard"

...GET THESE ADVANTAGES

Production ✓
Adaptability
Fixture Saving
Operation Saving
Material Saving
Fine Finish
Flatness ✓
Close Limits



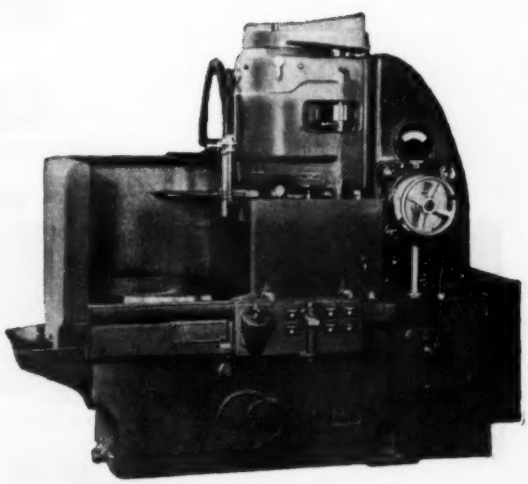
Grinding Cast Iron Bottom Plates

This is an excellent example of the large work that can be easily ground on the 36" magnetic chuck of the No. 18 Blanchard Surface Grinder.

Three of these 36" cast iron bottom plates are ground per hour removing $^{1}/_{32}$" of metal on one side, within .0005", to make a watertight joint without gaskets.

Whether the piece is large or small there is less setting-up time and greater accuracy when you "put it on the Blanchard".

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



No. 18 BLANCHARD SURFACE GRINDER

BLANCHARD

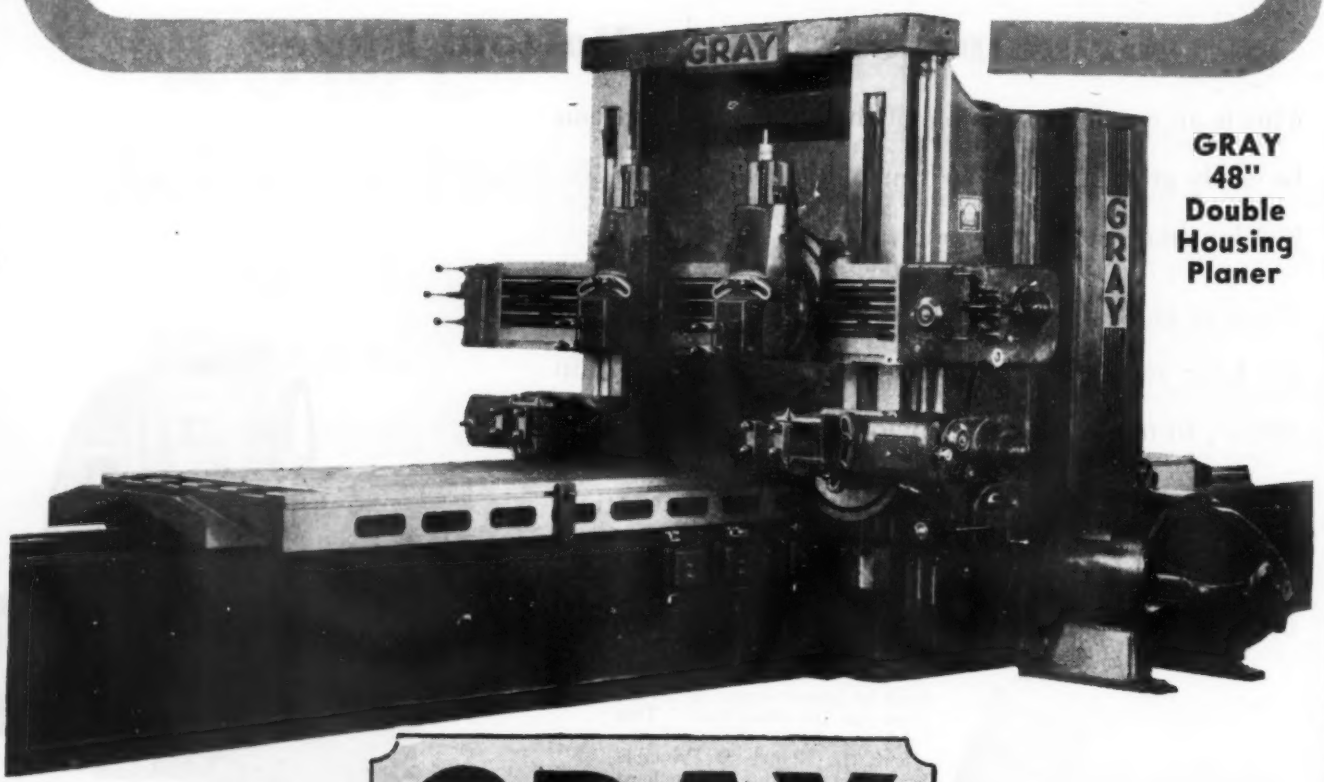
The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

SAFEGUARD QUALITY WITH GRAY AUTOMATIC LEVELING

● After you have lowered the rail of a Gray Planer, it is automatically raised a fraction of an inch before it is reclamped. This raising of the rail takes out all backlash between the elevating screws and nuts and so automatically relevels the rail.

This is just one of the numerous ways in which Gray design and Gray workmanship safeguard the quality and quantity of your output.

Bulletin 40-R illustrates and describes in detail the many features of this machine. *Write for your copy.*



GRAY 48" Double Housing Planer

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

Precision —

THE DISTINGUISHING QUALITY OF SOUTH BEND LATHES

It is for their high precision that South Bend Lathes are best known. Their dependable accuracy has made them first choice for the most exacting work in hundreds of essential war production plants. Finish turning and boring operations are often performed with such exactness that subsequent grinding, honing, or lapping is unnecessary.

In war production, there is no place for equipment that can not hold required tolerances or deliver maximum output. Investigate the possibilities of South Bend Lathes for handling your exacting jobs with greater efficiency. With them, you will find it easier to maintain precision tolerances on toolroom and production operations.

South Bend Engine Lathes and Toolroom Lathes are made in 5 sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes made in 2 sizes: Series 900 having 9″ swing with ½″ collet capacity, and Series 1000 having 10″ swing with 1″ collet capacity.

NEW CATALOG NOW READY

Write For It!

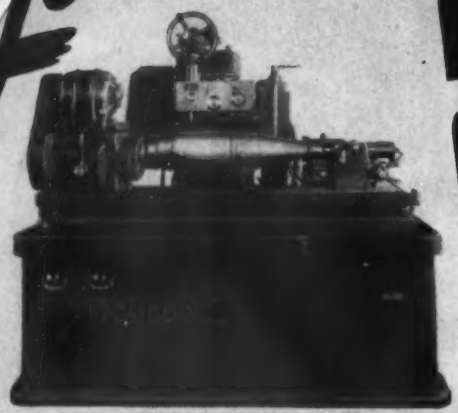
Illustrated in full color — showing all types and sizes of South Bend Lathes. Ask for Catalog No. 100-D.

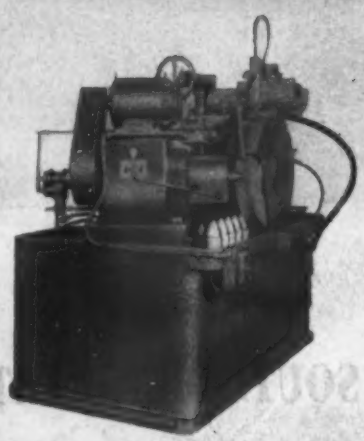
Lathe Builders For 38 Years

SOUTH BEND LATHE WORKS

419 E. Madison St. • SOUTH BEND 22, INDIANA

You can RECONVERT FITCHBURG GRINDERS





This book shows how to cut grinding costs . . . Sent free . . . write for it today.

With reconversion ahead Fitchburg users should keep in mind all Fitchburg Bowgage Head Precision Grinding Wheelhead Units are standard and interchangeable.

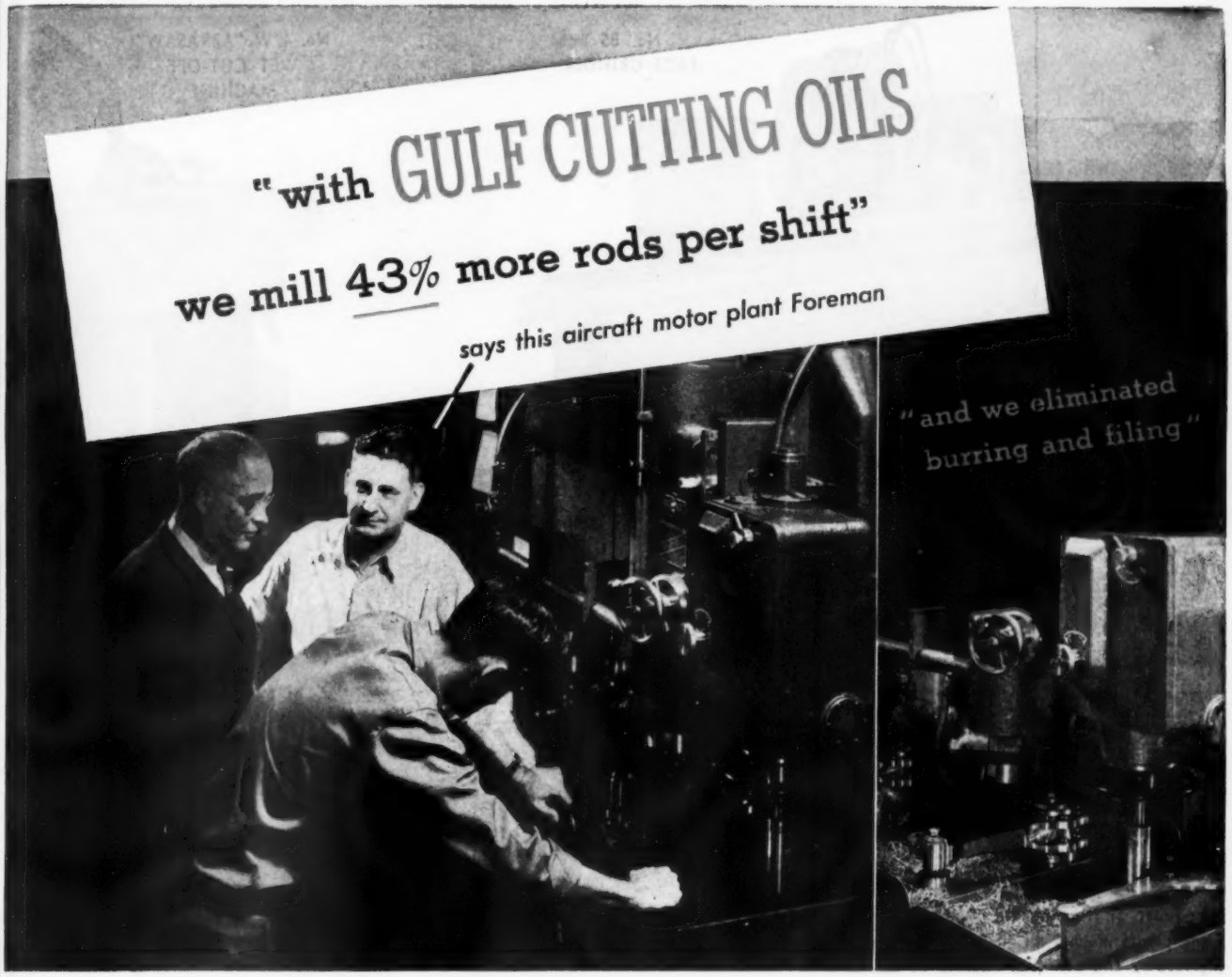
If the grinding operations for which they were purchased are discontinued, the heads can be remounted on standard machines, or on new special bases, for operations other than the ones originally specified. This is particularly appreciated by those using Fitchburg Grinders for ordnance production.

This exclusive Fitchburg feature protects your investment, and we suggest that future buyers of special purpose grinders or plain cylindrical grinders first consult Fitchburg engineers. Write us today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.


"with GULF CUTTING OILS
we mill 43% more rods per shift"
says this aircraft motor plant Foreman
"and we eliminated burring and filing"

Actual photo of a Gulf Service Engineer (left) consulting with Foreman in plant of prominent Texas aircraft engine manufacturer on cutting oil requirements for milling master connecting rods.

"With soluble oil, average production on this profile miller was 16 master connecting rods per shift," says this Foreman. "With Gulf L. S. Base and Gulf Cut-Aid, we were able to step up the feed, which resulted in a production increase of 7 rods a shift—and smoother milling with Gulf Cutting Oils helped us eliminate burring and filing."

Again and again, on the most exacting war assignments, Gulf Cutting Oils have made outstanding improvements in production and tool life. Here's the important reason: Every Gulf Cutting Oil has specific properties which insure better performance on certain types of machining jobs!

It will pay every machine shop to learn the full possibilities of Gulf's production-proven cutting oils. Call in a Gulf Service Engineer today and let him show you how they can help you with your machining problems. Write, wire, or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION · GULF REFINING COMPANY

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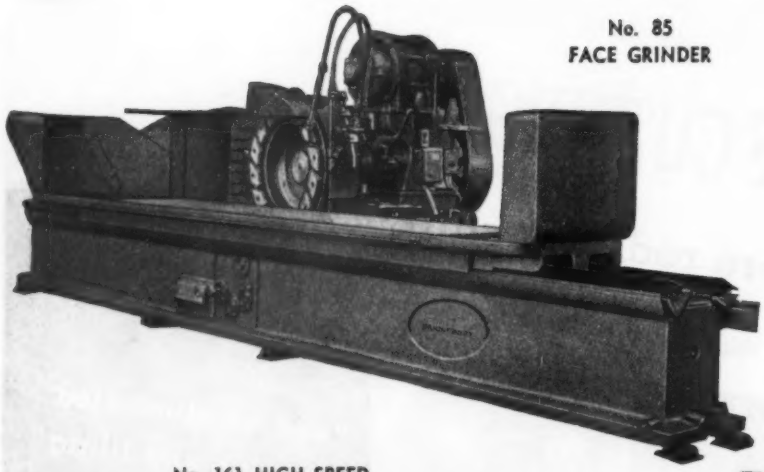
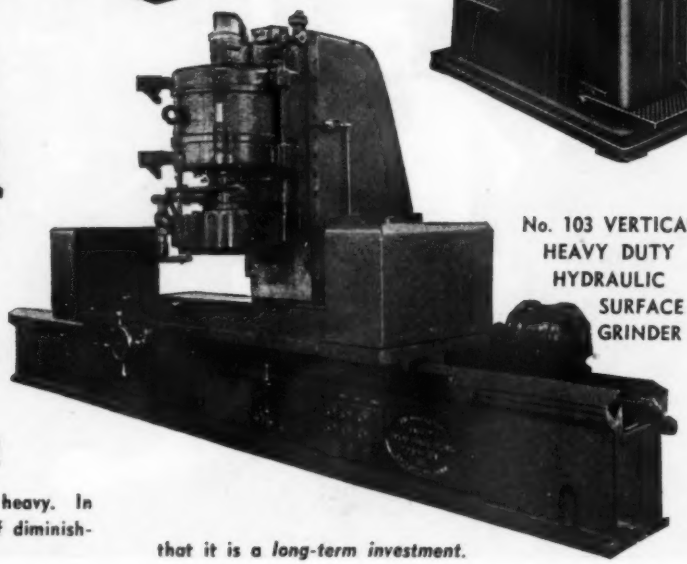


No. 85
FACE GRINDER

No. 47W "ABRASAW"
WET CUT-OFF
MACHINE

No. 161 HIGH SPEED
MOTOR DRIVEN
FLOOR GRINDER



No. 103 VERTICAL
HEAVY DUTY
HYDRAULIC
SURFACE
GRINDER

IN MANY METAL WORKING DEPTS.
IT'S TIME TO RE-EQUIP!

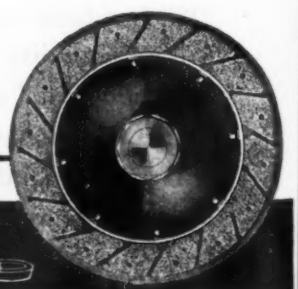
War wear on the machinery of the country has been heavy. In many plants much vital equipment is nearing the point of diminishing returns and will soon have to be replaced.

Operators who wish to plan so as to give top-notch service in war work now, yet be ready later for the postwar era with sound fundamental equipment, may well look into "Bridgeport" Grinders, Grinding Wheels, Cut-Off Machines and other metal removing machinery. For, wherever speed and an accurate, well-finished product are important, "Bridgeport" equipment will demonstrate beyond all doubt that it is a *long-term investment.*

Such things as long-lived, smooth running bearings, improved cooling systems, extreme ruggedness without excess bulk, handy location of controls and adjustments, are only a part of the refinements that have helped to place the "Bridgeport" line in major industries of the U. S. and foreign countries. Our engineers are always at your service.

THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC. • BRIDGEPORT, CONN., U. S. A.

Bridgeport



GRINDERS • GRINDING WHEELS • BUFFING LATHES

"BRIDGEPORT" DEALER REPRESENTATION

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Hartford, Conn., and
Statler Bldg.
Boston 16, Mass.

NEW YORK STATE
Rudel Machinery Co.
100 E. 42d St.
New York City 17

PHILADELPHIA
E. A. Lynch Mach. Co.
Times Medical Bldg.
Ardmore, Pa.

WASHINGTON, D. C.
G. C. Salomone,
805 8th St., N. W.,
Washington 1, D. C.

VIRGINIA and
N. and S. CAROLINA
James McGraw, Inc.
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Richmond, Va.

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Brokaw Machinery Co.
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Cincinnati, Ohio

CHICAGO
Bryant Mach. & Eng. Co.
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Chicago 6, Ill.

MINNESOTA
Anderson Mach. Tool Co.
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St. Paul, Minn.

ST. LOUIS
Blackman & Nuetzel Mach. Co.
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TEXAS
G. F. Cotter Supply Co.
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Sabin St. Germain & Assoc.
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Rees Machinery Co.
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Detroit 11, Mich.

CLEVELAND
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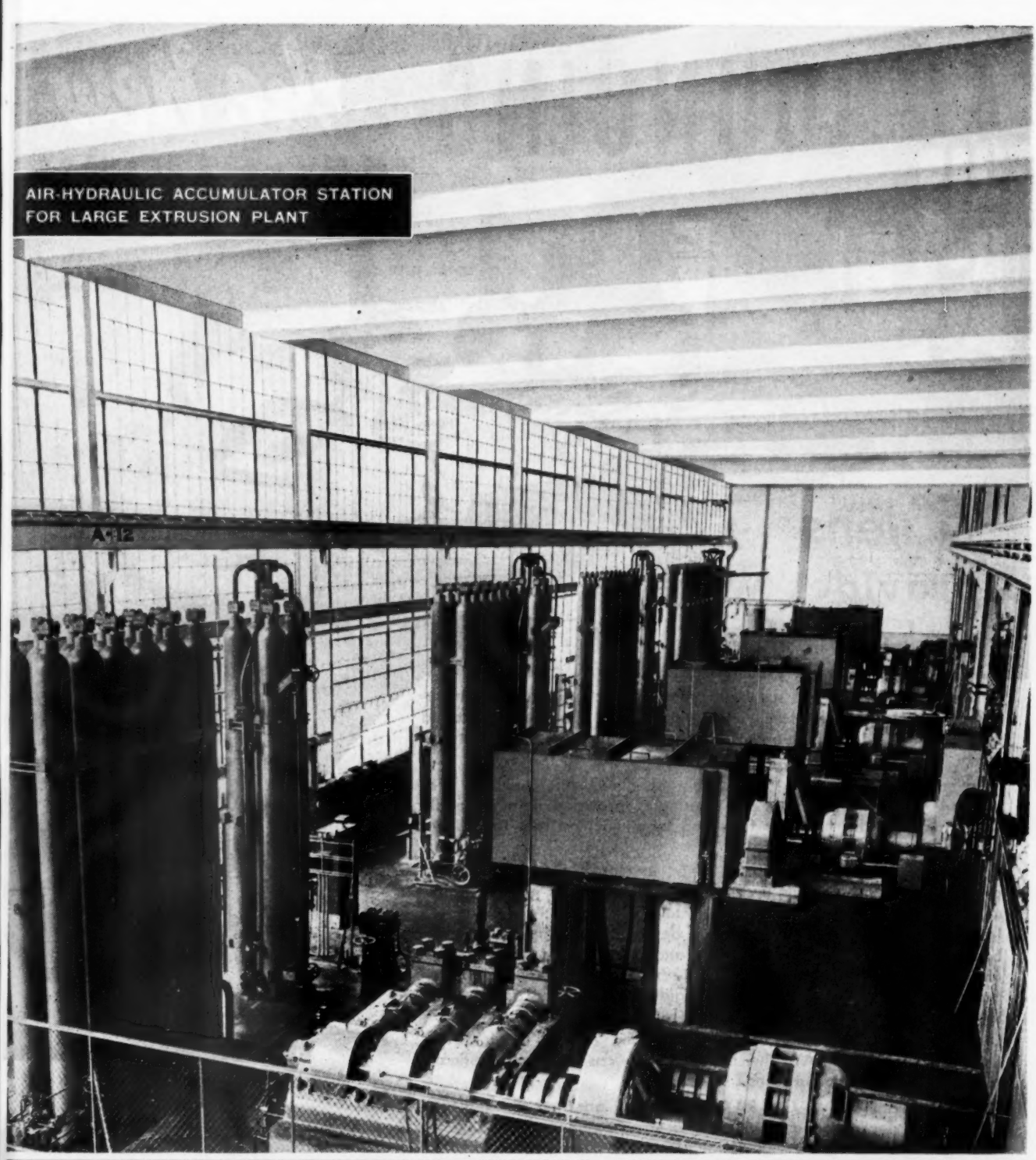
Cleveland, Ohio



AIR-HYDRAULIC ACCUMULATOR STATION
FOR LARGE EXTRUSION PLANT

HYDROPRESS · INC.

ENGINEERS *CONTRACTORS*

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570 LEXINGTON AVENUE · NEW YORK · N. Y.

ANNOUNCING...the New MAGNI-RAY

Model "C"

5" lens provides wider field observation

Designed to simplify and speed up visual inspection, this latest member of the MAGNI-RAY family, the Model "C", has been developed to meet the need for a means of observing a much wider field at one time.

It is encased in a strong, lightweight aluminum alloy casting. For convenience in transporting, the housing is provided with a handle which may also be used for fastening to a machine tool to observe turning and grinding operations.

The lens of the new MAGNI-RAY is 5" in diameter and is of high-grade optical glass, giving clear, undistorted vision of the object under inspection. Housing is attached to a 16" upright rod extending from the base. A universal clamping device permits the lens with its housing to be swivelled up-and-down and side-ways as required. The magnifying device is supported by a 12"x12"x12" triangular cast iron base of sufficient weight to provide rigidity and stability and to prevent tilting.

Light is directed upon work from two 4" long 25-watt tubular bulbs mounted in MAGNI-RAY, the inside of the case being specifically silvered for reflection purposes.

The new Model "C" MAGNI-RAY is especially adapted for detecting cracks, imperfections and blow holes in large castings. It is ideal for military map reading, as well as for use in assembling small, delicate mechanisms, inspection of ground, polished or lapped surfaces. Burrs, surface defects and other imperfect workmanship, not readily apparent to the unaided eye, are quickly detected by means of this new instrument. Inspection, receiving, drafting, machining departments and even first aid rooms have many uses for the MAGNI-RAY because of its almost unlimited field of application.

The MAGNI-RAY is wired for use on 110 volt current, A.C. or D.C. Full information is available promptly on request. Price—complete instrument, with stand, bulbs, electric cord and plug.....$29.70 net

Using the MAGNI-RAY by hand for critical inspection of precision parts.

●

Magnification and visibility of parts inspected by MAGNI-RAY are clearly apparent here.

GEORGE SCHERR CO.
INCORPORATED
200 LAFAYETTE STREET NEW YORK 13, N. Y.

two-day curing job.. cut to 7½ minutes

Cross section of grinding wheel . . . formerly oven baked . . . heat soaks in slowly from surface.

Same section . . . now cured by radio-frequency heating . . . heat builds up speedily, evenly throughout.

The old, slow oven cure took 48 hours—just to heat the resin bond of a grinding wheel 8½" in diameter by 1¼" thick.

Now 7½ minutes are plenty . . . heat mounts at 20°C per minute . . . and splitting due to uneven heating is no longer a major hazard. Now it's done by radio frequency which heats dielectrics uniformly from center to skin.

This speedy heating is often applicable to processes in wood, chemicals, plastics, rubber, textiles and dozens of other products—with no waiting for heat to "soak in" and no rejects due to overheated surfaces.

This accurate, uniform heating is simplified into a "push button" job for unskilled help, with all equipment and controls in one safe, spacesaving cabinet. The cabinet is shielded to minimize interference with radio communications.

Single standard units are available in output capacities ranging up to 200 kw. The range of frequencies is wide enough for almost every dielectric and induction heating need. For more information, write for Descriptive Data 85-800. Or, for suggestions on a specific application, ask a Westinghouse engineer to call. Westinghouse Electric & Manufacturing Co., P.O. Box 868, Pittsburgh 30, Pa.,

J-08097

2 KW RADIO-FREQUENCY GENERATOR

This unit has a nominal output of 2 kw. Controls and meters are all conveniently located on front panel. Circuit breaker and relays are readily accessible through the lower door on left side of cubicle.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Electronics at Work

then he said to himself

"You're in it for life!"

To those who look at postwar simply as a date on the calendar, the words of Charles F. Kettering, Vice-President, General Motors, add *duration* to that date. Says he:

> "We ought to pay more attention to the future. We ought to pay more attention to it than we do to the past, because every one of us is going to spend the rest of his life in it."

What sort of a life that may be is governed largely by what a man does for his product

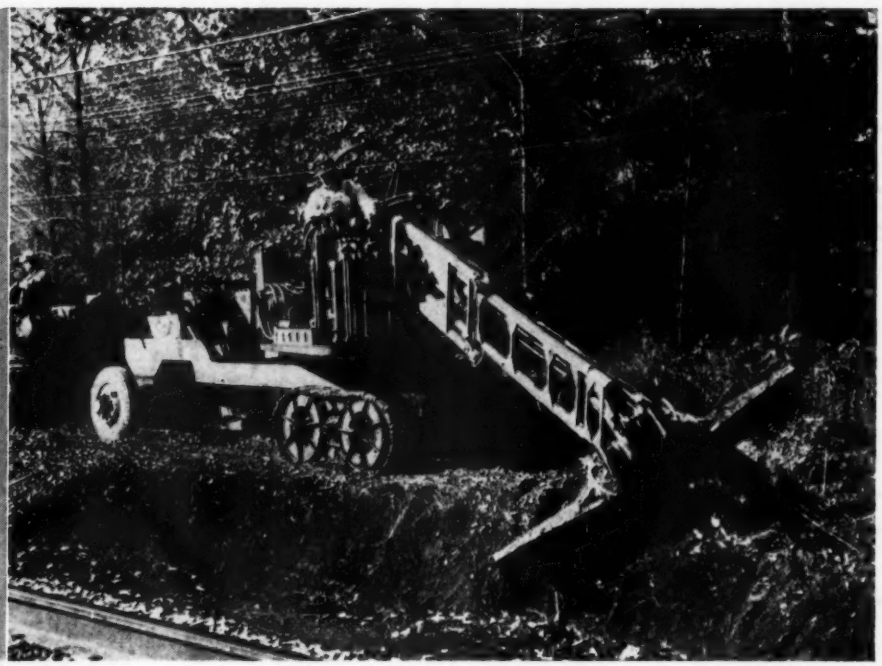
> . . . for it is "Boss" Kettering's contention that he is *not* boss . . . that the machine he is working with is *always the boss*. If he is not doing the right thing for the machine, the machine will not do the right thing for him.

Practicing that philosophy, many men are making products that will assure a successful future.

"Pay Attention to the Future," *he says*

LOOK, MR. KETTERING, how recourse to Arc Welding provides the key to success for ideas in machine design:

MAN WITH AN IDEA STRIKES PAY DIRT WITH WELDED DESIGN



DRAINAGE experience in his homeland Holland and in America taught Ray Ferwerda the need for a machine that would work with the maneuverability of a man with a rake, with his earth-moving power multiplied many thousand-fold.

Thinking in terms of *welded design,* Mr. Ferwerda developed such a machine and improved it until today it is unique in the field of finish-grading equipment.

This man is now president of the F. W. F. Corp., Cleveland, Ohio, manufacturers of the "Gradall" shown above. This machine does many jobs such as the finishing of highway slopes and ditches at about 1/10 the cost of manual grading . . . opens up entirely new fields for progress with better, low-cost drainage.

The strong, welded steel arm of this versatile machine reaches out and pulls dirt . . . or scoops it up and swings it away. All movements of boom and blade are controlled hydraulically. The boom is telescopic and, because of its rigid tubular construction, can be extended 12 feet to a total length of 25 feet.

This is typical of many success stories in which *welded design* has provided potent brainpower for a man's climb upward.

Are you taking advantage of Arc Welding as a means of assuring a secure future? The Lincoln Engineer nearby will be glad to assist you.

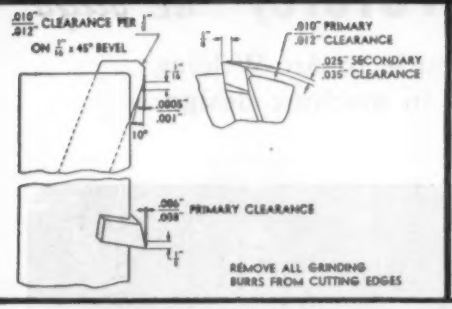
THE LINCOLN ELECTRIC COMPANY • Cleveland 1, Ohio

America's greatest natural **recourse**

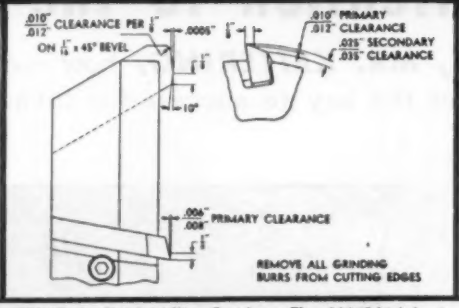
ARC WELDING

INGERSOLL *Grinding Chart*

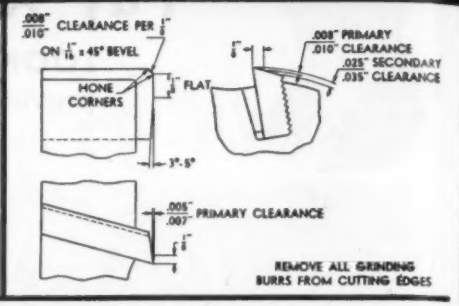
BASIC GRINDS FOR STANDARD CUTTERS



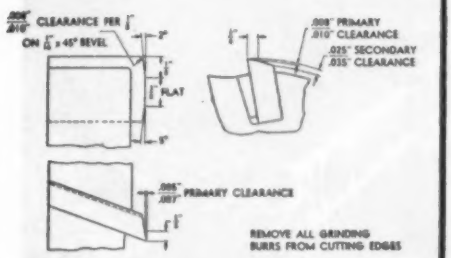
GRIND 1. Rough Milling Cast Iron.



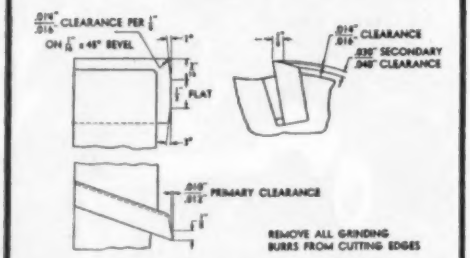
GRIND 2. Finish Milling Cast Iron. The .0005" high heel may have to be changed to suit the tilt of the spindle. This can be determined from the finished surface.



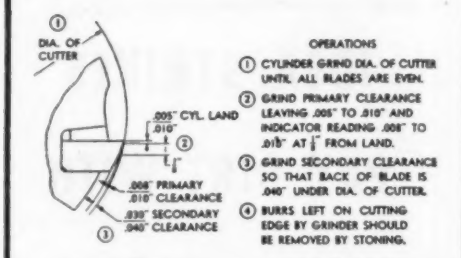
GRIND 3. Rough Milling Low Carbon Steel.



GRIND 4. Finish Milling Low Carbon Steel. If chatter is encountered, reduce the length of flat on face.

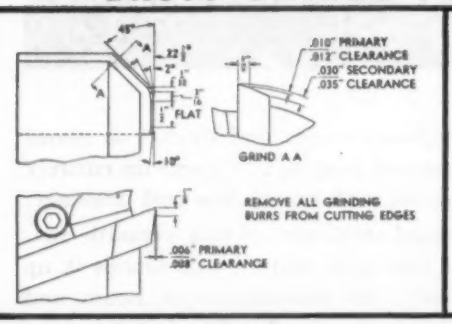


GRIND 5. Rough and Finish Milling Aluminum. Hone to a keen smooth cutting edge.

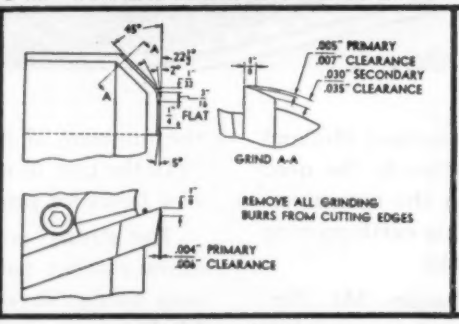

1
DIA. OF CUTTER
.005" CYL. LAND
.010"
2
.008" PRIMARY
.010" CLEARANCE
.030" SECONDARY
.040" CLEARANCE
3
OPERATIONS
1 CYLINDER GRIND DIA. OF CUTTER UNTIL ALL BLADES ARE EVEN.
2 GRIND PRIMARY CLEARANCE LEAVING .005" TO .010" AND INDICATOR READING .008" TO .010" AT 1/4" FROM LAND.
3 GRIND SECONDARY CLEARANCE SO THAT BACK OF BLADE IS .040" UNDER DIA. OF CUTTER.
4 BURRS LEFT ON CUTTING EDGE BY GRINDER SHOULD BE REMOVED BY STONING.

GRIND 6. Helical Slab Milling Cutter.

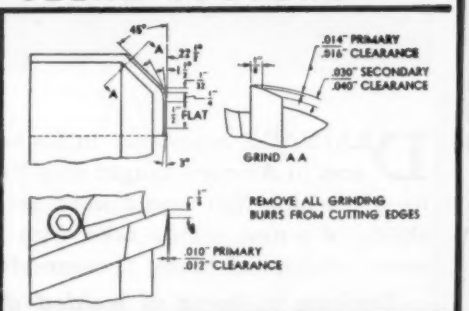
BASIC GRINDS FOR INGERSOLL SHEAR CLEAR CUTTERS



GRIND 7. Milling Cast Iron.



GRIND 8. Milling Steel.



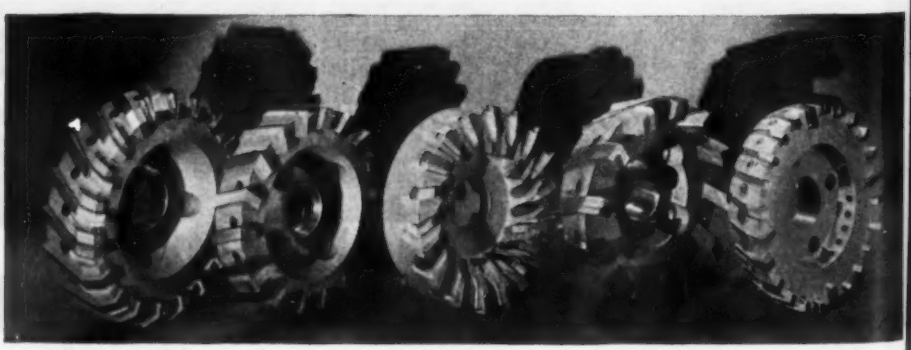
GRIND 9. Milling Aluminum. Hone to a keen smooth cutting edge.

NOTE: *Copies of these charts, suitably mounted for hanging in your tool room, are available upon request.*

To obtain best results with your milling cutters it is essential that they be properly ground. Minor variations may be necessary to suit particular conditions, but satisfactory results will be obtained if cutters are ground in accordance with these charts.

For further information on the technique of grinding milling cutters write for Ingersoll Bulletin No. 54 describing the Ingersoll Cutter Grinder.

Ingersoll manufactures inserted blade milling and boring tools of all types. These are shown in our Engineering Specification Sheets available on request.

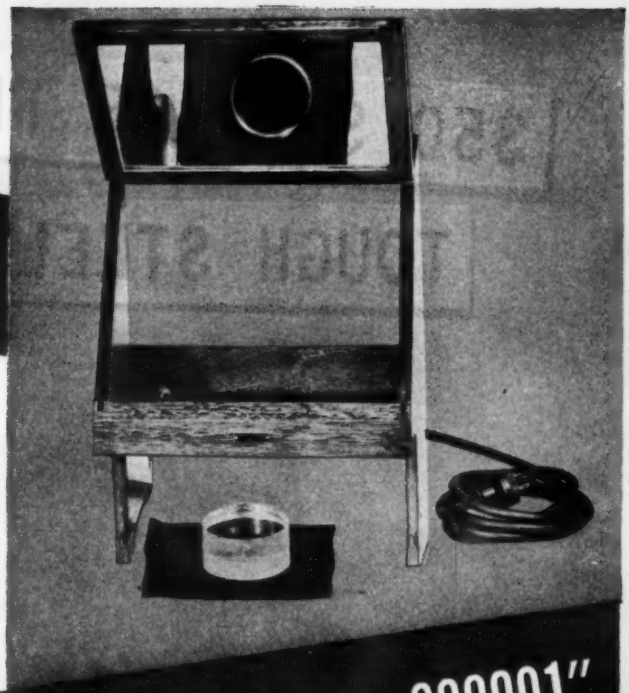


SHEAR CLEAR N X RAY BLADE Heavy CONE TYPES Medium

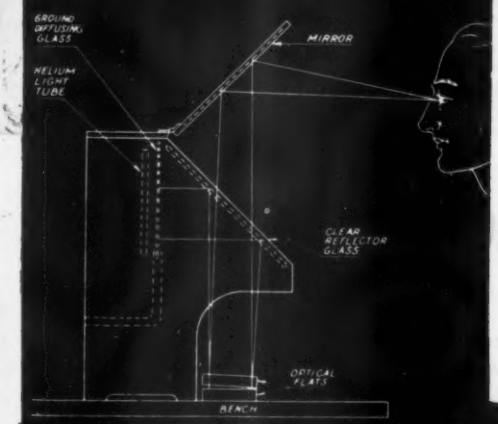
THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

Announcing...

the NEW Van Keuren TYPE L. improved Laboratory MONOCHROMATIC LIGHT



Assuring true light band values, accurate to .000001"

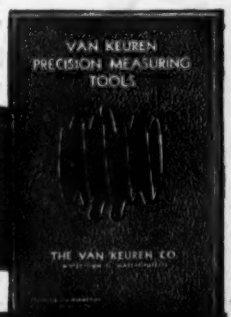


nearly perpendicular to the surface of the optical flats. As the observer moves away from the mirror, this line of vision becomes more nearly perpendicular. This distance is limited only by the width of room in which the light is used.

This Type L Monochromatic Light is designed for use in comparing gage blocks for size, and for checking optical flats and ultra precision surfaces, where results must be accurate to one or two millionths of an inch.

The advantages of the Type L Monochromatic Light is that the line of vision is nearly perpendicular to the surface being tested. Therefore, the light wave bands have their correct value of .0000116" per dark band. Where other monochromatic lights show flat surfaces to be slightly concave, the Type L Monochromatic Light gives true results to an accuracy of better than a millionth of an inch. The Type L light is convenient to use. It starts instantaneously and it has a tube life of 2,000 hours.

With the new Van Keuren Improved Monochromatic Light, light wave bands have their correct value of .0000116" per dark band. Further details are available on request.



THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

350 SURFACE FEET PER MINUTE

TOUGH STEEL...TOOLS TAKE IT

SUNOCO EMULSIFYING CUTTING OIL

removes 35 cu. in. of S. A. E. 1045 steel per minute

Cut deep . . . cut fast . . . cut long—that's the task for tools today, and throughout America production men are relying on Sunoco Emulsifying Cutting Oil.

In one operation, on an American Pacemaker Lathe, they were turning S. A. E. 1045 steel at 270 RPM and taking a cut ⅜" deep. The diameter of the piece being turned was 5"—350 surface feet per minute. In every minute, 35 cubic inches of tough steel were removed . . . but the tools "took the rap" thanks to Sunoco Emulsifying Cutting Oil.

Tool life increases when tools and work are flooded with Sunoco. The outstanding cooling and lubricating qualities of this cutting oil makes possible the prevention of overheating and drawing of the temper at the cutting edge and the reduction of "down time" for tool resharpening and resetting. Chips do not seize; the tools cut cleanly . . . evenly . . . at high surface speeds.

To speed production in your plant, get the details on Sunoco Emulsifying Cutting Oil . . . and to get worthwhile factual data on all types of machining operations, write for your copy of "Cutting and Grinding Facts" to . . .

SUN OIL COMPANY · ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUNOCO

SUN INDUSTRIAL PRODUCTS

OILS FOR AMERICAN INDUSTR

FEBR

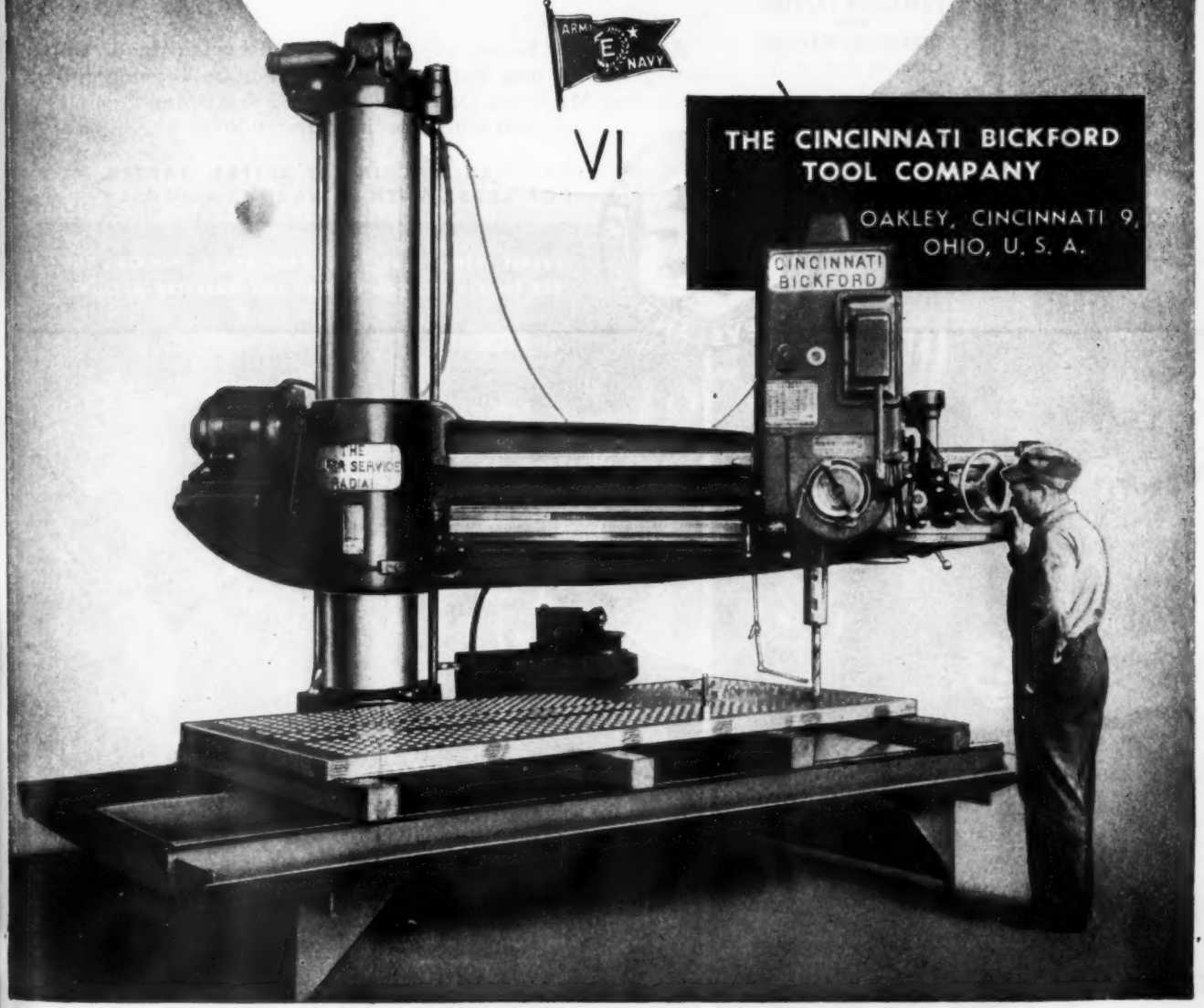
"Round-the-clock"
SAVINGS WITH THE

SUPER SERVICE RADIAL

Despite "round-the-clock" applications of Super Service Radials, a high rate of production includes a cost-saving of about 25%, according to the Air Preheater Corporation, through whose courtesy the accompanying photograph was released. The work illustrated shows drilling operations on maritime airheaters.

Throughout the country, this same report of efficiency is being repeated. Based on this wartime production efficiency, the Super Service warrants favorable consideration in your conversion plans. Write now for Bulletin R-24A, listing all features and full specifications.

ARMY E NAVY



THE CINCINNATI BICKFORD TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U. S. A.

3 Years CONTINUOUS OPERATION with a perfect record

Warner & Swasey No. 11
PRECISION TAPPING
AND
THREADING MACHINE
Capacity 8-36 to ⅛".

THE Warner & Swasey No. 11 Precision Tapping and Threading Machine shown below has been on the job for the Purolator Products Company, Newark, N. J., *running continuously* 24 hours a day for *over three years.*

The work handled on this machine demands thread accuracy to meet strict Army Air Force class 3 fits. The new principle of lead screw and solenoid actuated guide fingers enables precision threads to be cut on a production basis. Holding tapping depth to .010" is another requirement easily met by setting the sensitive depth control. With Warner & Swasey Tapping Machines, depth accuracies can be held consistently to 1/10 revolution of the tap.

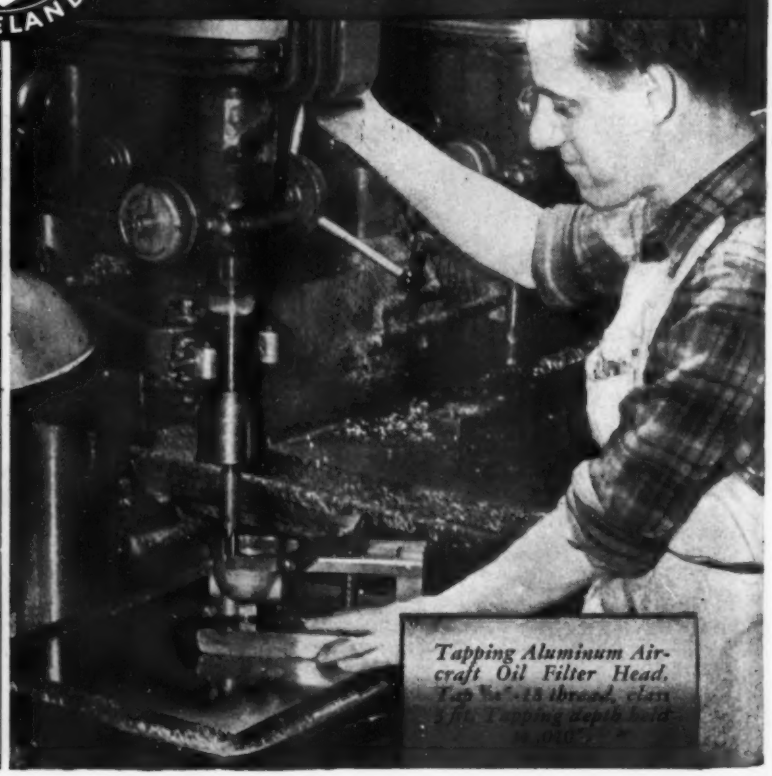
A Safety Clutch, which releases and stops the tapping operation if the tap becomes dull, hits a hard spot or strikes chips in a blind hole, is another feature which prevents tap breakage or work spoilage.

A Warner & Swasey representative can explain many advantages of the new Warner & Swasey Precision Tapping and Threading Machines. Or write for catalog describing the four models with capacities from 0-80 to 2½".

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS..,WITH A WARNER & SWASEY

WARNER & SWASEY — W&S — CLEVELAND

TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES



Tapping Aluminum Aircraft Oil Filter Head. Tap ⅝"-18 thread, class 3 fit. Tapping depth held .010".

Materiel—or Men

ONCE AGAIN, bitter as it may be to admit it, we are back at a point where time is of the essence in our war production program.

It is startling news that at this late date in the war the Ordnance Department of the Army is confronted by one of the largest and most urgent emergency manufacturing requirements since the war began.

Here's why. We Americans have been fighting a war different from any ever fought before in history.

Our theory is that if we hurl the greatest possible tons of materiel against the enemy, we thus will hurt him the most, advance our cause the most, and save more of our own men's lives.

Proof that our kind of war pays is the fact that in the Pacific we have lost one man, with supporting materiel, for every thirteen Japanese. We took Aachen at a low cost in men because of the great concentration of fire from 105-mm. howitzers and because of heavy air bombing.

This kind of war, especially since artillery began to loom so importantly, is consuming far more materiel than estimated. The truth is that the rate of fire of certain types of shell used in the largest volume has so increased that it is now fifty percent greater than the amount being produced.

No stockpile, no matter how big, can long survive such rapid depletion.

If we are to adhere to the policy that lives are of more value than materiel, we must supply the extra munitions that soon will be vitally needed.

Labor is short. Time is short. The necessary munitions must be produced with the least delay. It will take time enough to transport them from the factories to the coast, then overseas, and finally from foreign ports to combat areas.

It is imperative, therefore, to get into production quickly. Every day saved is a day gained. Wherever idle machines can be found that are suitable for the new program, they should be put to work. There is not time to wait for new machines to be built if existing machines are available, or to try to do the job the ideal way.

Representatives of the Office of the Chief of Ordnance are now scouring the country for machines that will fit the special requirements of shell manufacture. They deserve the cooperation of every loyal American who has at hand a machine or a number of machines that can be utilized in this emergency program.

If you can aid these representatives in ferreting out what they need, if you will surrender to them for transfer elsewhere your machines that are not busy on war work, or if you are in a position to help by taking on a subcontract, you are urged to get in touch with the ordnance office in your district immediately or with Machine Tool Panel Headquarters, Room 401—1420 Walnut Street, Philadelphia, Pennsylvania.

Let's continue to give our fighting men overwhelming superiority in materiel!

Burnham Finney

● This production machine was developed by Morris to speed up the production of precision parts for aircraft engines.

Standard hydraulic units are used throughout. The heads carry 54 drilling and reaming spindles. The work holding fixture is arranged for hand clamping.

The machine is exceptionally easy to operate and does not require specially trained operator. You merely place the work in the fixture, clamp it by means of hand clamp, press a button and the heads function automatically.

This is only one of many special machines built by Morris for high production. Morris has the organization — the engineering staff and production facilities to design and build special equipment for the mass production of specific *jobs*.

Consult them on your production equipment

MORRIS
Production
EQUIPMENT

MORRIS MOR-SPEED RADIAL

Builders of MOR-SPEED *Radials*

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

Military Training Techniques Suggest New Ideas for Industry

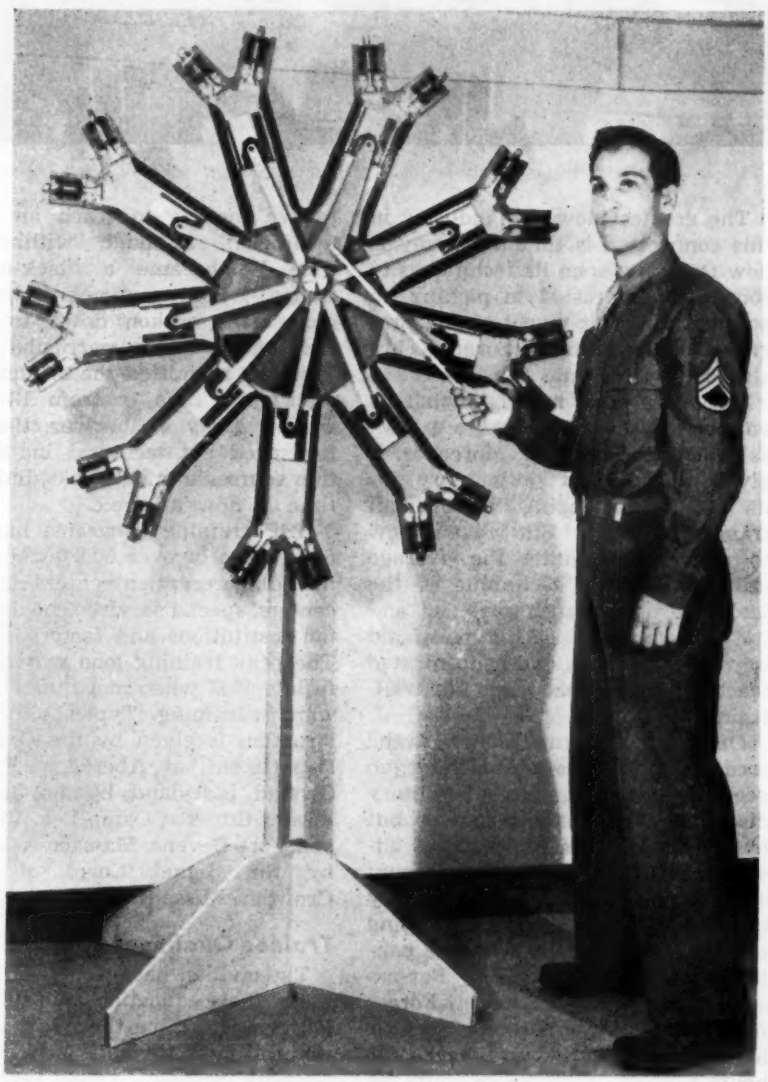
BY BENJAMIN W. CORRADO, NEWS EDITOR, AMERICAN MACHINIST

To train millions in haste, the U. S. Army has improved on best available industrial methods, with emphasis on visual aids. The technique presents some interesting points for industry

AFTER AMERICAN FORCES had captured the demolished port of Cherbourg, it was speedily repaired and put into efficient use by skilled U. S. Engineer Port Construction and Repair Groups, who used captured German materials and machinery in the process. Concrete German tank obstacles, debris from wrecked buildings, and explosives from salvaged Nazi Tellermines were used by these resourceful Army men to rebuild the port. Captured German trucks were repainted, reconditioned, and put to work, within 24 hours.

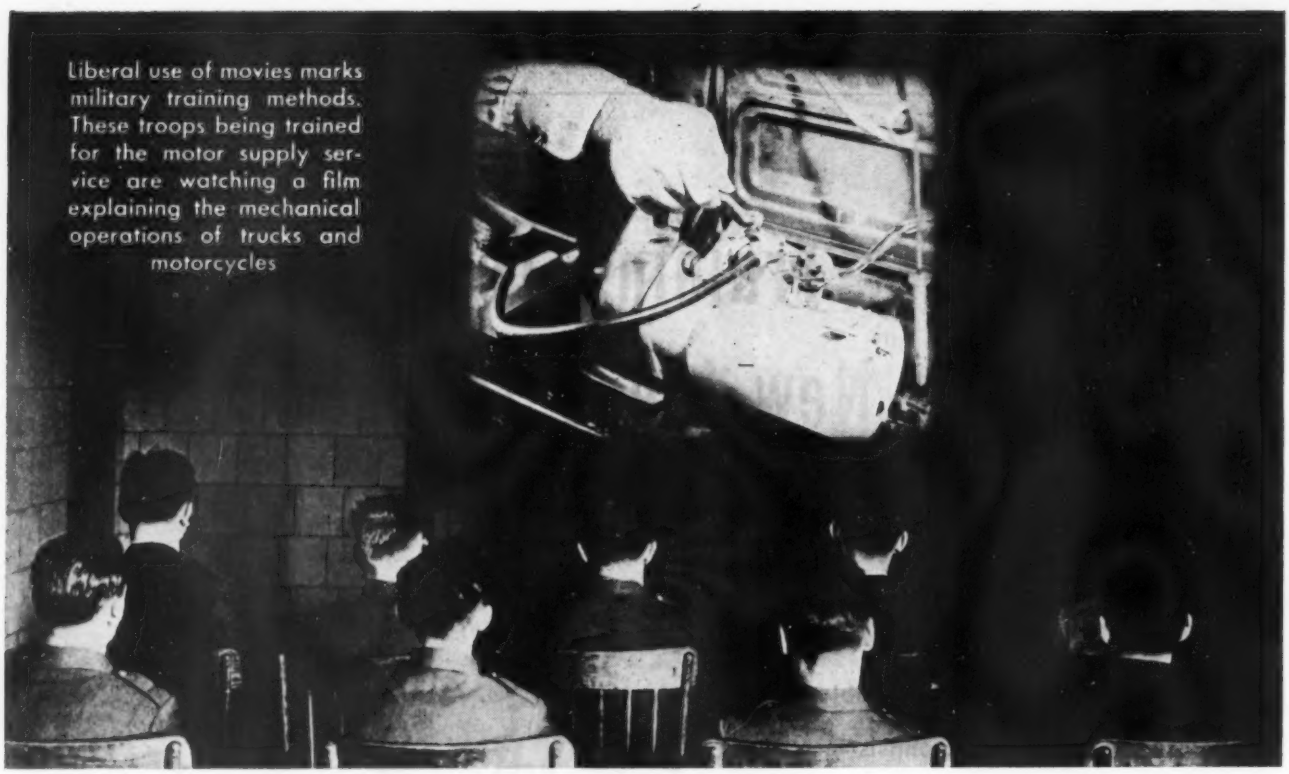
What happened at Cherbourg was not unusual for Army technicians. Similar exploits are being performed all over the world under extreme handicaps, during actual combat, and with improvised materials. But these accomplishments all stem from the skill imparted by Army training methods, which have successfully instructed over 3,500,000 officers and enlisted men and women in some 1,853 military occupational specialties.

The success and scope of this mammoth training job of the Army Service Forces has attracted the attention of American industry, particularly to the visual training aids used in these courses. These not only include the mediums commonly used in industrial instruction, such as charts, movies and demonstration classes, but they entail resort to mock-ups, cutaways, blow-ups of small items, scale models of large items, and almost every conceivable way to illustrate a principle or technique.



FULL-SIZED MODEL USED AS VISUAL

Army trainees view a Wright radial engine model as a practical side to their studies. The model permits the instructor to demonstrate timing, firing order, valve functioning and connecting rod assembly



Liberal use of movies marks military training methods. These troops being trained for the motor supply service are watching a film explaining the mechanical operations of trucks and motorcycles

The greatest news for industry in this connection is that the Army is now throwing open its techniques to companies interested in picking up pointers for their own training programs. And leading corporations are already looking into the matter.

The Army does not claim that its various visual aid devices are new, as indeed they aren't. Moreover, it gives much credit to industry for its aid in developing the over-all training program. But what is new to anyone examining the average military training technique is the intensive use of such material and the integration of each type of aid into an interesting and concentrated teaching course that turns out well-trained men.

Of course, no small part of the credit for this effective teaching job goes to the maintenance of military discipline through these courses, but by the same token some of this advantage is written off by the amount of time spent in basic military training and physical conditioning required concurrently with the particular instruction received. For example, the Army Service Forces machinist course, requiring 576 hours spread over twelve weeks (48 hours a week), includes 36 hours for physical conditioning and 72 hours for basic military training, a total of 19 percent of the over-all instruction time involved.

In peacetime, it required nine to twelve months to teach an Army technician, although within that time he became a "jack-of-all-trades." For wartime, each technique was broken down to make men specialists in particular lines. This has permitted the reduction of instruction time to from 13 to 21 weeks. Early in the war, the need for speed cut technical indoctrination courses to nine weeks, but more time is now allowed.

ASF training programs have required use of over 500 installations, including reception centers, training centers, special service schools, civilian institutions and factory schools. The peak training load was reached in late 1943 when more than 720,000 were in training. Typical skilled instruction is given by the Ordnance Department, at Aberdeen Proving Ground, Maryland, by the Quartermaster Corps at Camp Lee, Virginia, and Fort Devens, Massachusetts, and by the Signal Corps at Camp Crowder, Missouri.

Trainee Qualifications

The civilian background of its soldiers, their education and aptitudes, largely determine the Army's selection of men to be sent to special training schools. Once there, the trainee finds that major emphasis in the instruction is upon doing and observing, rather than on being told. That is where the Army's extensive variety of visual aids come in.

The War Department's Technical Manual for Army Instruction states: "No lesson is complete without training aids; they add interest and vitalize learning in any class situation." The manual adds, "soldiers remember things they see and hear much longer than those heard only."

The majority of Army instructors use visual aids. Planning of the visual material to be used is as careful as the outline of the points to be taught.

Instructors are urged not to limit themselves to those training aids already on hand, but to develop new ones wherever they find one to be helpful. But the physical limitations of training aids must be appreciated in planning for them. The size of the room in which the instruction is to take place should be considered, the size of the class, the permanency or temporary nature of the course, available materials and equipment, and so on.

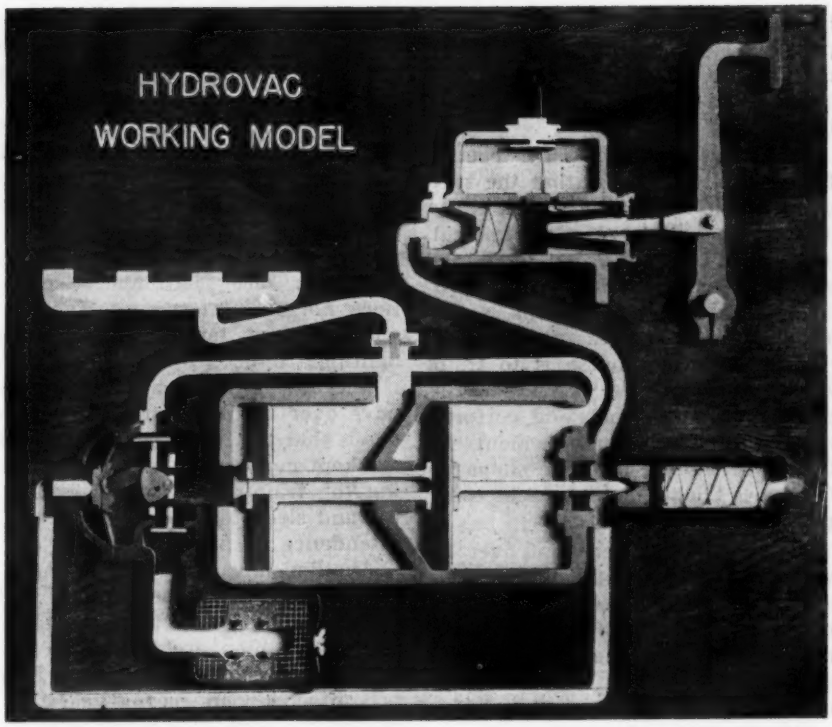
Mock-ups are in most popular demand. Many of them are instructor designed, on the spot, to help put over a particularly difficult part of some instruction. It has been found that mock-ups frequently reduce the explanation time required for a particular item. For example, in one case a model of a .45 cal. pistol disconnector cut explanation time from 20 minutes down to five minutes.

Some mock-ups are so ingeniously

designed that an involved piece of mechanism is simulated so that its entire workings can operate visibly, enabling the students to appreciate clearly the principles involved. For example, an actual carburetor with a transparent exterior was made, permitting observation of the actual fuel flow.

Mock-ups are made out of wood, cardboard, metal or any material that is available and fairly suitable. They may duplicate a set of gears with each part removable to enable complete observation and discussion; or they may illustrate the workings of a plane propellor; or brake action in an auto. The enlisted men who make them have frequently had previous training as architects, draftsmen or artists. That is why many mock-ups give an almost "Rube Goldberg" impression in the way they actually work in demonstrations. The moving parts of some of them hold the attention of the students and permit the imparting of basic knowledge on the subject.

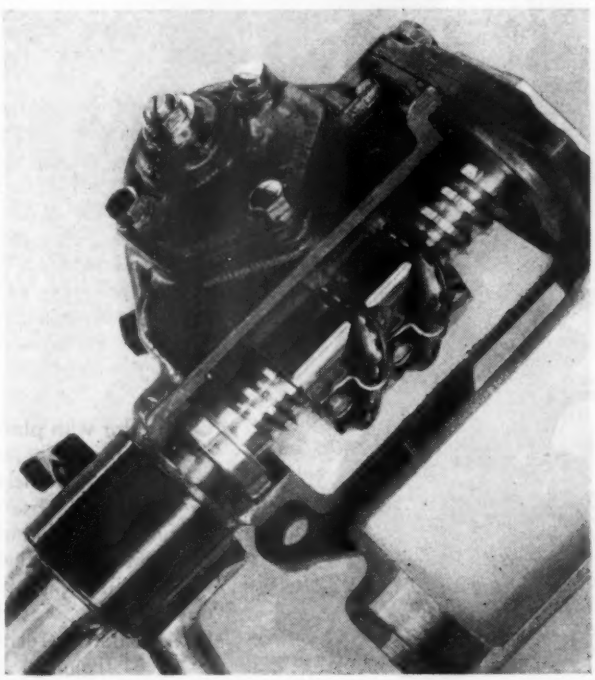
Army officers are the first to admit the limitations of mock-ups. They warn that excessive application of them can make them a "crutch," requiring students to go back to the visual many times to help them do the actual work later on. Such mistakes occur when the visual presentation becomes an actual road map into every aspect of a particular piece of mechanism. That is why expert instructors generally use such aids for the more difficult part of the explanation, preferring to allow the men to work on the entire mechanism itself later on and learn its operation in that fashion.



A working model illustrates the flow of brake power through the master cylinder and the hydrovac. Devices of this kind make clear the operation of mechanisms that would be difficult to describe

Another handicap of mock-ups is that sometimes they are so exaggerated for the sake of simplification in presentation, that they become a "detour" to the actual knowledge to be imparted. It then becomes necessary for the instructor to keep telling his students from time to time to forget the mock-up when they turn to the work itself. In some cases, it would be more difficult to set up a mock-up of a particular item, than to have the students work with the real thing.

Training films are most helpful for orientation. Troops are frequently shown films covering the major phases of the course or activity to be learned, before the intensive instruction starts.



"Foldaway" model of a 2½-ton 6 x 6 steering gear is so constructed that its sides can be swung aside to permit students to see the operation of its salient parts

Using Film Strips

Film strips, or stills, are generally designed for class lecture use. Thus, a series of shots can be held on the screen as long as desired, while the instructor explains the actual scene shown. The shots are pasted together in desired sequence, and many copies can be made for use in as many instruction classes. Their use is similar to slides, except that the film strip is much cheaper.

Lectures are also livened up by charts and cartoons, made to visualize or explain a fact or an idea, while blackboard demonstrations point up easier concepts that can be changed by the instructor to answer questions or open discussions.

The Army makes frequent use of the delineascope or balopticon projectors. These are so built that the instructor can slide the page of a

book, a photo, or a sheet of printed paper under it, and have it projected on a screen so that the entire class can read a statement or view an illustration.

Prerequisite for the Army's course for machinist requires that the student be able to read and write, know arithmetic, and have a mechanical aptitude of Class III or better. While previous experience in machinist or metal-working operations is desirable, it is not essential. The "mission" of the course is to train selected personnel to "use hand, precision, and power tools and perform machining operations incident to Ordnance mobile machine shops of Ordnance field maintenance companies."

The course is spread out over 12 weeks, at the rate of eight hours a day, six days a week, and includes nine hours weekly of basic military training and calisthenics. A summary of the type of instruction given, and its sequence week by week is given below:

WEEK OF COURSE	INSTRUCTION GIVEN
1st	Safety regulations, shop math, machine shop problems, measuring instruments, blueprints, use of grinders.
2nd	Use and care of hand tools, layout of tools and instruments, and preparing and marking surfaces.
3rd	Use and care of vertical saw, use and care of drills, classification of metals and identification by grinding, use of common shop forms, and use and care of shapers.
4th	More on shaper operations.
5th	Wind-up of shaper instruction, and introduction to milling machines.
6th	More on milling operations.
7th	Wind-up of milling instruction, and introduction to lathe operations.
8th	More lathe instruction.
9th	Finish of lathe instruction, and work on practical problems and projects in machine tool operations, applying previous instruction.
10th	More practical problems.
11th	Finish of practical problems, maintenance and operation of power unit, annealing, hardening, and quenching metals, and tempering operations.
12th	Final instruction on tempering operations, and automotive machine tools.

The Army appreciates that the graduates of such courses as this are not completely qualified for the work they are to do subsequently. However, it depends upon subsequent field work under the supervision of more experienced men to enhance their skill. And experience has proved that these men can and do perform the difficult assignments that later face them under conditions not encountered in any commercial plant far away from the fighting fronts.

One advantage that these courses have over industrial training methods is that the men being instructed are kept in constant association during the training period. They live, eat and sleep together. Then again, attendance is mandatory.

Another advantage is the indoctrination given to the men so that they fully appreciate the importance of the job they are to do and are proud of the service to which they are attached. In recent years, industry has developed many methods of seeking this same effect via company sports teams, house organs, outings and parties. To some extent, war production drives have intensified such efforts, and it is likely that many of these wartime activities may be carried on after the war. Moreover, it is highly probable that these may be enhanced by ideas picked up from the military.

But training does not end at Army schools in this country. Constantly changing equipment, and emergency and combat conditions frequently warrant additional training. As a result, training schools have been established abroad to give such instruction in electronics, hydraulics, gun turrets, engines and instruments. A typical training emergency occurred in England where bombing planes returning from missions were coming back shot full of holes, thus requiring a large number of sheet-metal workers to make the necessary repairs. A training course was set up and by late 1944, over 4,500 sheet-metal workers had been trained in England.

Even at advanced bases, technicians are kept together, instead of being scattered with different units. Thus, propeller specialists would be in one area, structural stress engineers in another, and so on. This has been found to improve morale and efficiency, as well as cutting down on transportation.

One practice industry could adopt is the Army's plan of giving re-

Carburetor with plastic sides can be installed on a vehicle so that visual observation is permitted of the flow of the fuel through it while in operation. It is used in Automotive Technical Training

Emergency field conditions are simulated for these ordnance troops being trained for combat duty. In a blackout workshop, a Technician 4th grade assures Brig. Gen. H. R. Kutz, Chief of Ordnance Military Training Division, of the swift repair of an engine in a few hours

fresher courses, not only for enlisted personnel, but for Army officers. Such instruction is designed to bring all members of the service up-to-date on latest developments and newly established practices.

It goes without saying that the instructors who give the ASF abbreviated courses are excellent, and here again, industry might pick up a few pointers. Instructors are trained by the Army at officer candidate schools and special service schools, in addition to being selected from the ranks of trainees.

Each training center has a leadership course for three percent of its basic training capacity. Selected trainees with a minimum of 14 weeks' instruction, who have shown a capacity for leadership, attend a three-week course of instruction. After that they are assigned to six weeks of practical training as acting non-commissioned officers with training platoons. After completing this training, these men understudy and eventually replace more experienced men, who are constantly being moved into the field.

Industrial instructors would find many helpful ideas in the War Department's Technical Manual, Army Instruction, TM 21-250. Not only does this book specifically outline preferred procedures for planning a course of instruction, but also how to make the courses interesting, how to hold the students' attention and things instructors should avoid. Effective cartoons illustrating the manual are likely to convince instructors far more effectively on what they should and should not do, than a discussion of these points. Even the psychology of handling men is pointedly set forth in a few pages.

Army cartoonists have gone to work on the relating of all sorts of important messages swiftly and humorously, thus tearing a leaf out of a device which industry has found successful in recent years

It should be emphasized that the Army had few experienced instructors to draw on after the outbreak of war, and that most of the thoussands of teachers since trained (the actual figure is a military secret) had had no previous experience as instructors. The Army says that former salesmen have made particularly good instructors.

Industry is interested, because it cannot deny the value of these courses. They explain why a motor assembly reconditioning plant is being operated today in India, staffed by Army-trained Indian mechanics; why men trained in photography at the Army Air Forces Training Command School at Yale can take actual pictures without film or a camera, and can develop them without a darkroom; and why other miracles too numerous to mention are being performed every day by Army-trained men.

Fixtures Extend Usefulness of Trays for Pusher Furnaces

BY JOSEPH SAMMON, CHIEF FOUNDRY ENGINEER, THE DRIVER-HARRIS COMPANY

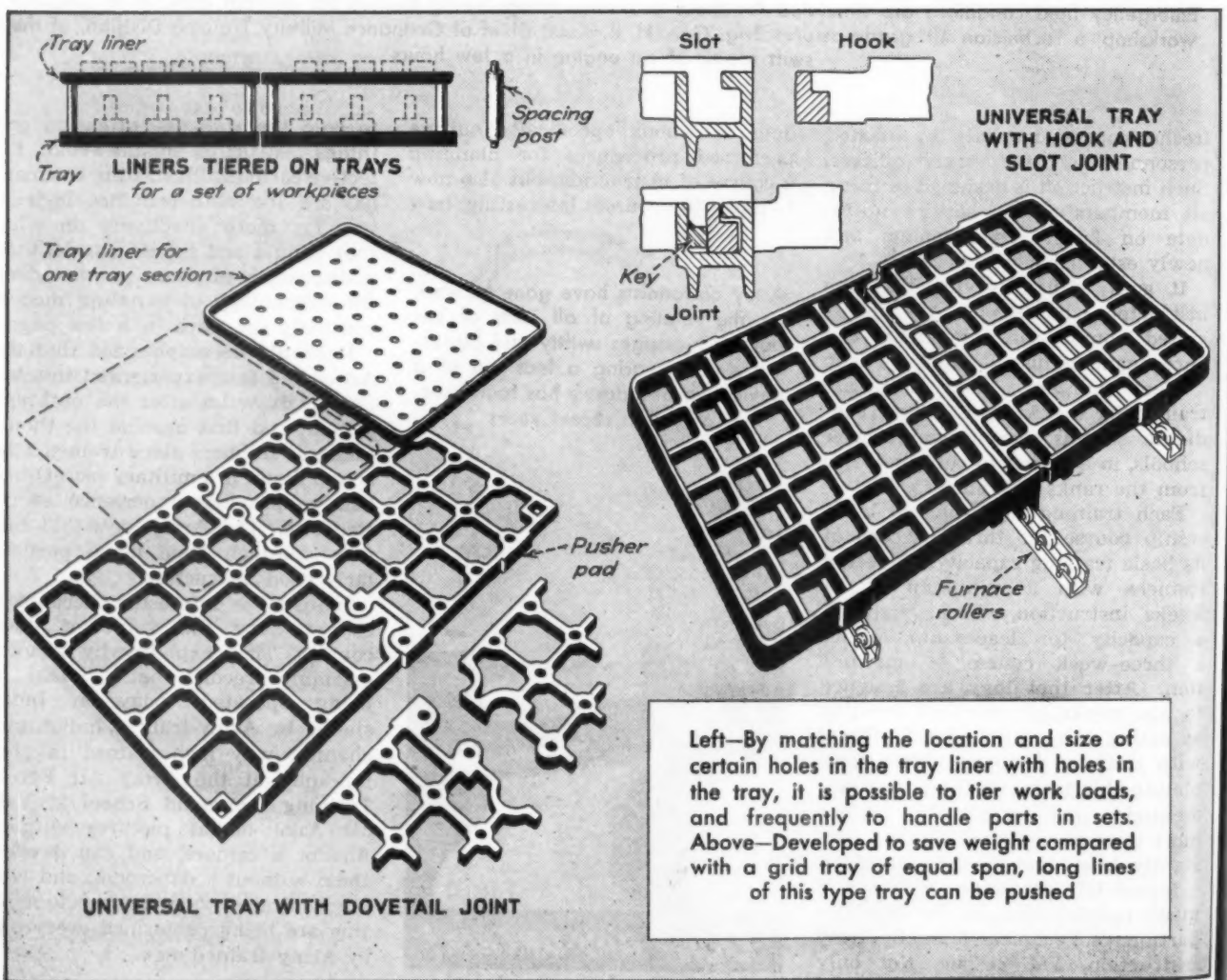
AS STATED in the previous installment, the designer of trays for pusher furnaces may select from four kinds of trays and a variety of tray fixtures in order to provide the heat-treater with "tools" which will handle the production load in the most efficient manner. Three kinds of trays were described—the grid type, cantilever, and circular-opening. In conjunction with these, details were given concerning appropriate fixtures. To conclude the subject of pusher-furnace trays, information is given on the universal tray and additional tray fixtures.

When a change takes place in a product, 90 percent of the trays on hand can be kept in service by purchasing new tray fixtures

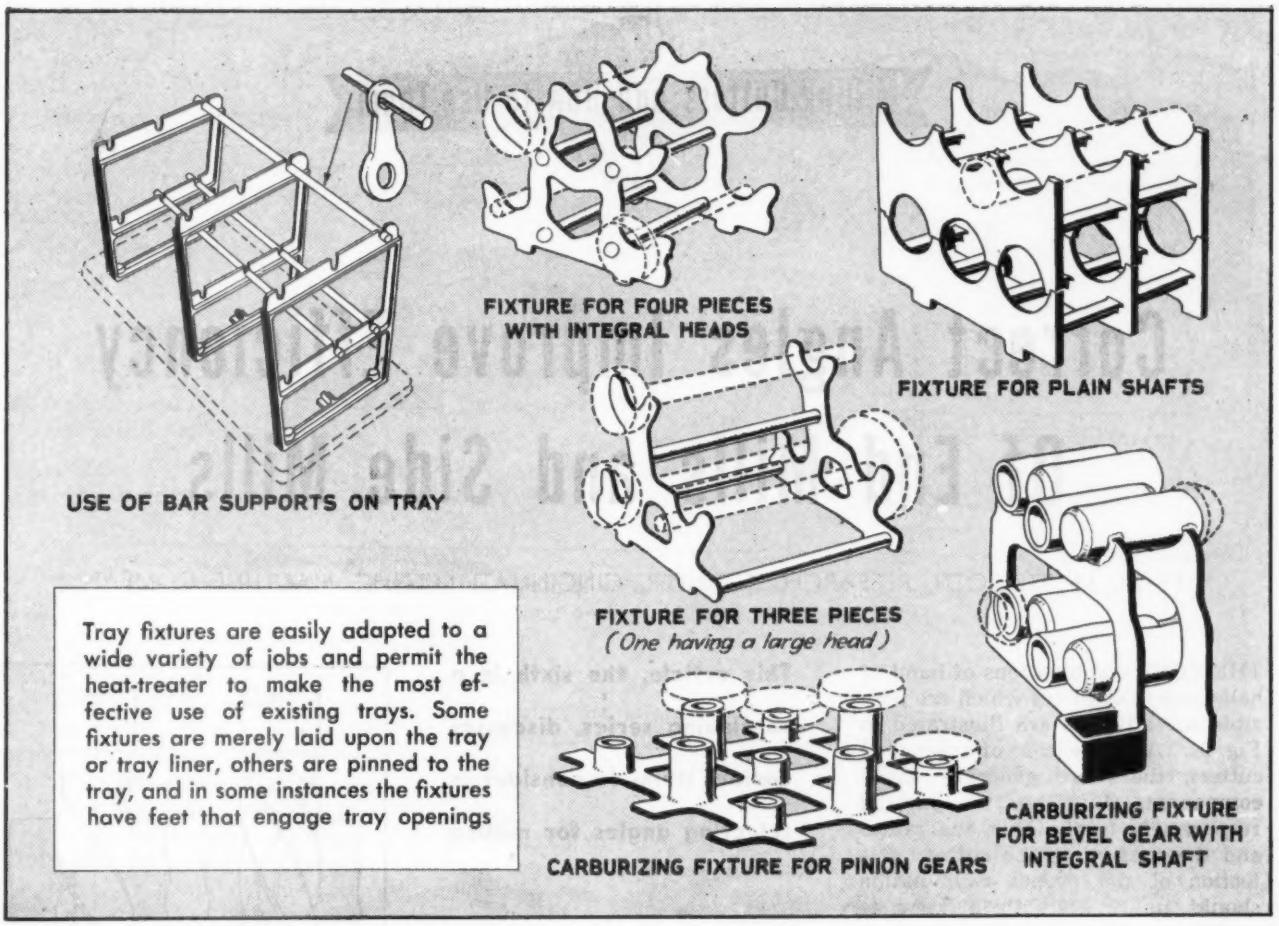
The universal type of tray derives its name from two circumstances: (1) The wide variety of ways in which it can be used, and (2) the ease and cheapness of replacement. In one design, the tray is made up of identical, rimless halves that are flat on both sides, and are joined to one another by means of semicircular dovetail joints. If one section fails, it can be replaced at less than the cost of a new tray.

In use, the two halves of the universal tray are joined together and are then pushed lengthwise through the furnace on three rails. The outer rails may be flanged to keep the trays tracking properly during the pushing cycle; the center rail merely furnishes support.

Work can be placed directly on the tray, but frequently tenoned posts are placed in the cylindrical



Left—By matching the location and size of certain holes in the tray liner with holes in the tray, it is possible to tier work loads, and frequently to handle parts in sets. Above—Developed to save weight compared with a grid tray of equal span, long lines of this type tray can be pushed


USE OF BAR SUPPORTS ON TRAY
FIXTURE FOR FOUR PIECES WITH INTEGRAL HEADS
FIXTURE FOR PLAIN SHAFTS
FIXTURE FOR THREE PIECES
(One having a large head)
CARBURIZING FIXTURE FOR PINION GEARS
CARBURIZING FIXTURE FOR BEVEL GEAR WITH INTEGRAL SHAFT
Tray fixtures are easily adapted to a wide variety of jobs and permit the heat-treater to make the most effective use of existing trays. Some fixtures are merely laid upon the tray or tray liner, others are pinned to the tray, and in some instances the fixtures have feet that engage tray openings

cored holes in the tray surface. Then a spacer or mesh is placed on top of the posts to support a second load of work. Two or more tiers can be built up in this manner to suit the furnace door height. Or work-holding fixtures can be put on the tray.

In another variation of this idea, an ordinary grid tray with runners is cast in two halves. The edge of one piece is slotted, the edge of the other is hooked so that it will engage the slot. Then a key is pushed into the remaining space, and the assembly is tackwelded. If one section of the tray fails, it can be replaced. Another advantage is that the assembly costs less than one large tray, an advantage if many of them are required to maintain production schedules. The cost saving is achieved because the assembly is approximately 25 percent lighter than a single tray of equivalent work area.

Tray Fixtures

Tray fixtures are the means by which the heat-treater can increase the flexibility of the pusher-furnace trays that he possesses. These items are less expensive than trays. When the shop takes on new work or a product redesign occurs that obsoletes previous set-ups, the plant can frequently continue the use of 90 percent of existing trays by obtaining suitable tray fixtures.

One type of fixture is designed for parts that can be strung on bars. In other words, any piece with a hole in it can be accommodated. The fixture consists of two end frames with pins in the feet to engage cored holes in the tray proper. Notches in the frames receive the loaded bars, which are placed horizontally.

Shafts, especially those with a head or integral gear on one end, are placed horizontally on cast racks. One form of rack consists of end frames resembling coral formations because of the recesses cast in them to receive the shafts. One rack may have four recesses symmetrically located on each end frame. Four workpieces are thus accommodated, two with the heads at one end and two with the heads at the other end to conserve space. In a variation of this idea, two of the work-supporting recesses are alike, and the third is of a different size. Thus, one rack will take two similar parts and one of a different size, comprising a set, so that furnace output is always balanced with respect to the number of the various pieces that must be heat-treated.

A somewhat different rack, but also intended for carburizing shafts, consists of a bottom casting having semi-circular recesses in the vertical spacers. This casting is provided with feet that engage holes in the tray. A second casting, with offset feet, can be stacked on the bottom casting to receive a second tier of workpieces. And additional castings can be built up for further tiers, depending upon conditions.

Selective carburizing of gears with integral shafts is also being done with the aid of tray fixtures. In principle, the fixture consists of a suitable number of tubes. One end of each tube is closed to receive the shaft portion of the workpieces. Gravity holds the shoulder of the gear against the open face of the tube, thus protecting the shaft from carburizing action. In one fixture, the tubes are welded to the cast frame in almost the horizontal position. But the open ends of the tubes are slightly higher than the closed ends so that the gear does seal the tube mouth. By building such fixtures with two or more tiers of tubes, a considerable concentration of work can be obtained on the tray.

Correct Angles Improve Efficiency Of End Mills and Side Mills

BY M. MARTELLOTTI, RESEARCH ENGINEER, CINCINNATI MILLING MACHINE COMPANY

This article, the sixth in a continuing series, discusses various items to consider in selecting angles for milling

THE FOUR combinations of hand of helix and hand of cut which are possible in end mills are illustrated in Fig. 24. As in the case of arbor type cutters, there are generally three components A_t, S_t and T_t parallel respectively to the axis, the radius and the tangent to the cutter. Selection of the proper combination should be made with a view to avoiding deflection of the cutter in the direction of increasing the depth of cut.

For milling slots where the end of the cutter is in contact with the work, it is usually preferable to have the hand of cut and the hand of helix *the same*—that is, right hand cut, right hand helix or left hand cut, left hand helix. On the other hand when profiling with the periphery of the cutter, and the end of the mill is not in contact with the work, the reverse is more desirable, namely, right hand cut, left hand helix or left hand cut, right hand helix.

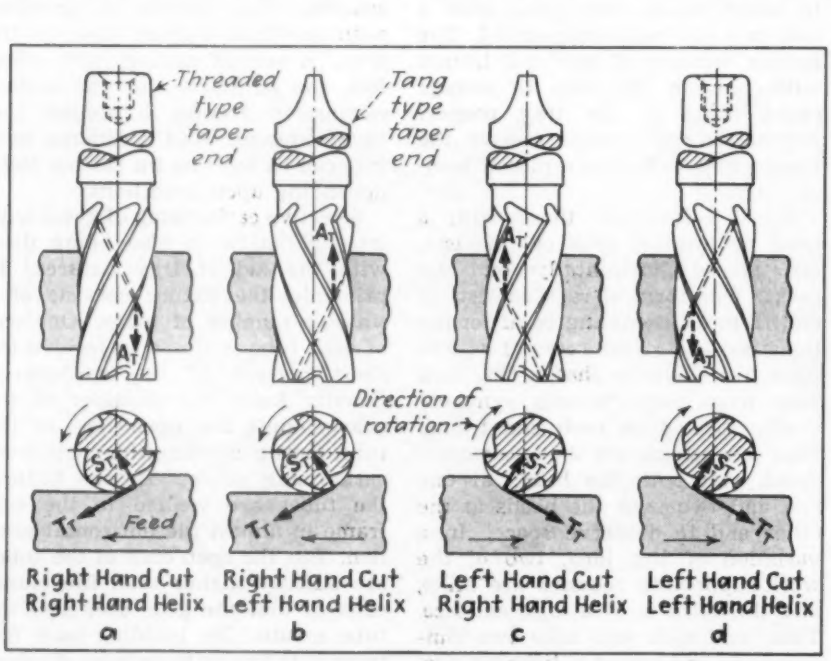


Fig. 24—Hand of helix and hand of rotation affect the cutting forces on an end mill

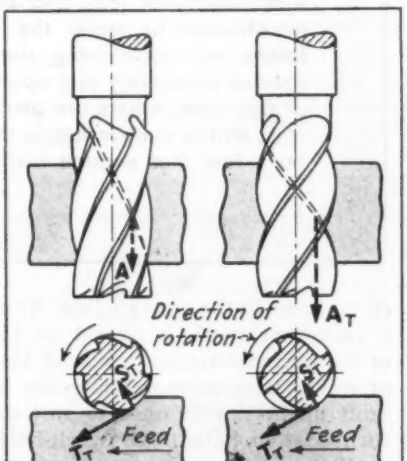


Fig. 25—For an equal cutting force the size of the helix angle determines the intensity of the axial thrust

In profiling, when the hand of cut and hand of helix are opposite, both the axial and tangential components A_t and T_t cooperation deflecting the cutter toward the work. Their effect is slightly reduced by the radial component S_t. The final result is that the cutter, in the case shown at *b* and *c* Fig. 24, tends to cut *deeper* into the work than intended. The axial force A_t acts *against* the spindle, thus providing additional means to hold the cutter in position.

When the hand of cut and hand of

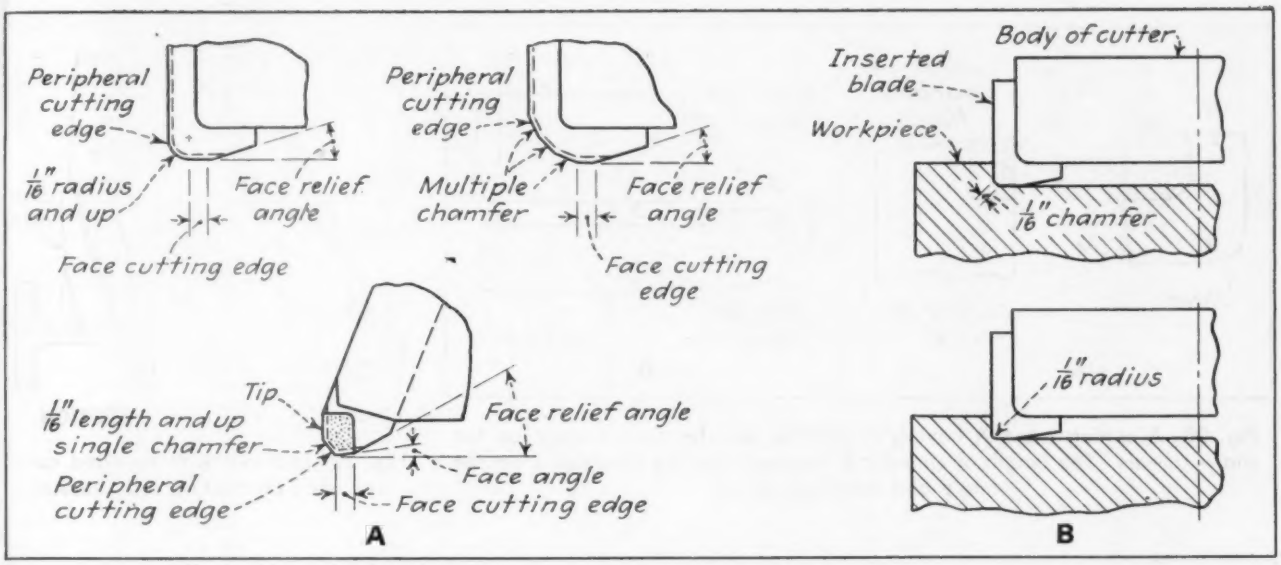


Fig. 26—At A is given the nomenclature of the elements of a typical tooth or blade of an inserted-tooth face mill. B gives the chamfer or radius ground on face milling cutters when milling a shoulder

helix are *the same,* (*a* and *d* Fig. 24) the axial components A_1 and S_1 oppose the action of the tangential component T_1, and the effect on the cutter may be either a deflection toward the work or away from it depending on the respective intensities of these components. The cutter, however, will not dig in or cut as deep as under the previous conditions. In this case, the axial force A_1 tends to pull the cutter away from the spindle and positive means should be provided to hold it in position.

In an end mill with a large helix *angle* (Part *b* of Fig. 25), the increased axial component A_1, cooperating with the radial component S_1 in opposition to a smaller tangential component T_1 will deflect the cutter toward the work a lesser amount than in the case *a*, where on account of a smaller helix angle, the axial component is smaller and the tangential component is larger.

In face mills the cutting edge extends along both the periphery and face of the cutter. The intersection of peripheral and face cutting edges is the point of the tool. This may or may not be a sharp corner depending on the contour of the "nose." The latter can be rounded or chamfered to suit the requirements of the milling operation. (Fig. 26*A*.)

A square nose should be avoided, however, because it breaks easily and ultimately either a chamfer or a radius will replace it.

In milling a square shoulder, Fig 26*B*, the teeth should be ground wherever possible with at least 1/16-in. chamfer or 1/16-in. radius so that the flow of metal along the small chamfer or radius will not greatly interfere with the main flow which is approximately at right angles to the cutting edge on the periphery of the cutter.

When a large chamfer is used, however, and the cutting is done on both the periphery and the chamfer, as when taking deep cuts, or when a double chamfer is used, the flow of the chip along these two elements of the cutting will interfere with each other and produce a crowding of the chip. Fig. 27 (left).

This results in less efficient cutting action, increased temperature at the corner, accelerated wear and shorter cutter life. Furthermore, the chip will tend to crumble and the small particles of metal may score the milled surface. Similarly a severe chip crowding will occur with a large radius nose.

In taking a deep cut in straight face milling operations, it is preferable to make the chamfer suffi-

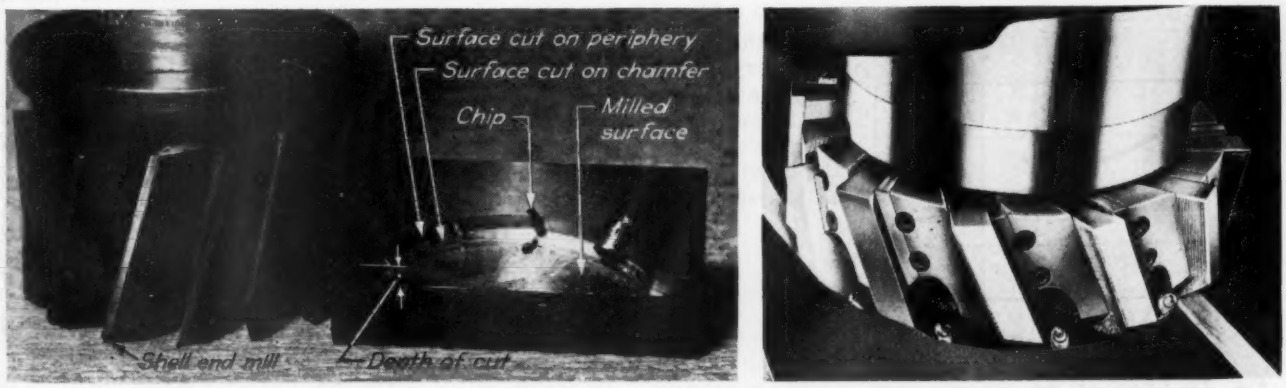


Fig. 27—The chip formation A resulted with a shell end mill having the teeth ground with a large chamfer and cutting both along the chamfer and the periphery. Because of the wide chamfer on face mill *B*, used in taking a deep cut, the cutting action is confined to the cutting edge along the chamfer, thus providing an unobstructed chip flow

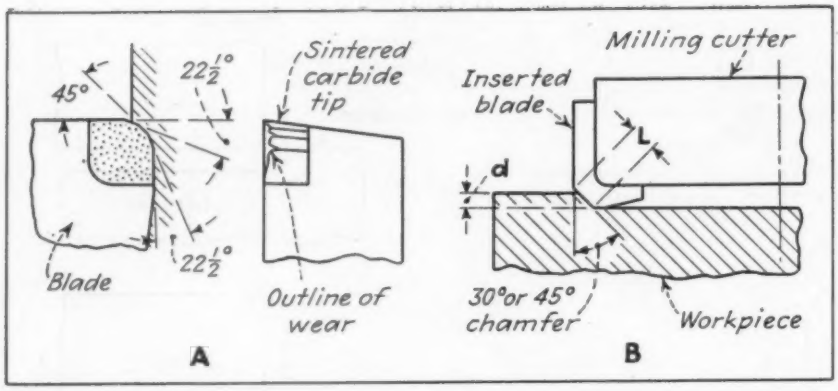


Fig. 28—A cutting edge A having a multiple chamfer causes wear on the sharp corners. The length of chamfer B required may be obtained from the angle and the depth of cut

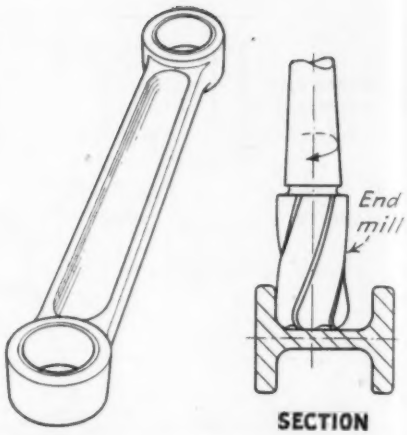


Fig. 29—End mill with rounded corners mills connecting rod channel

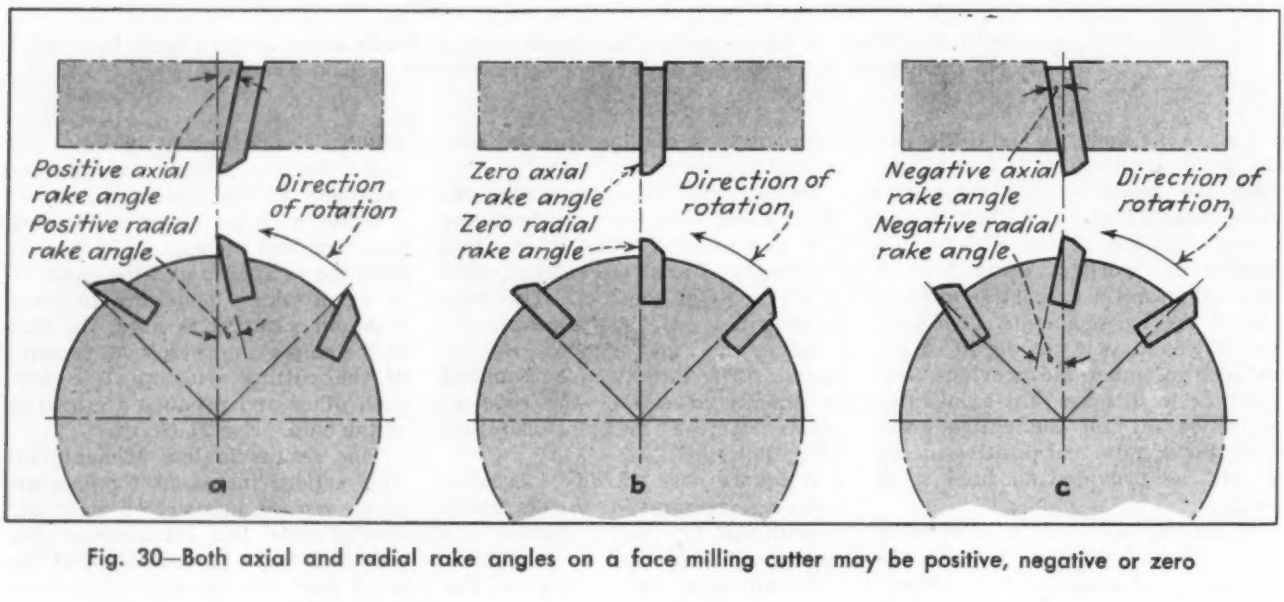


Fig. 30—Both axial and radial rake angles on a face milling cutter may be positive, negative or zero

ciently wide so that the cutting is confined to the cutting edge along the chamfer. This will permit an unobstructed flow of the chip approximately at right angles to the cutting edge. Fig. 27 (right).

A single chamfer therefore should always be used for blades tipped with sintered carbide material. Where the blade has a double or a multiple chamfer, wear and breakdown are likely to begin at the sharp corners. This is shown in Fig. 28*A*. Multiple chamfer also requires more time for sharpening.

As shown in Fig. 28*B*, the *angle of the chamfer* is measured from the periphery of the cutter. For the commonly used chamfer angles of 15, 30 and 45 deg. respectively, the length of the chamfer for given depth of cut can be calculated by means of the following formulas:

$$L_{15} = 1.10d \quad (1)$$
$$L_{30} = 1.25d \quad (2)$$
$$L_{45} = 1.50d \quad (3)$$

where:

L_{15}, L_{30} and L_{45} = the length of the chamfer in inches corresponding respectively to angles of 15, 30 and 45 deg., and d = the depth of cut in inches.

(The value of the constants 1.10, 1.25 and 1.50 has been increased by a small percentage so as to permit a slightly larger length of chamfer for a given depth of cut.)

In carbide tipped cutters, small chamfer angles together with the correct negative axial and radial

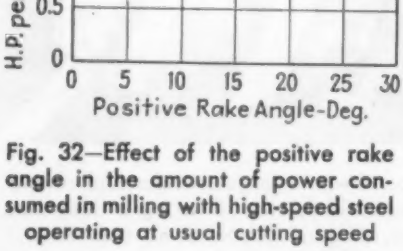


Fig. 32—Effect of the positive rake angle in the amount of power consumed in milling with high-speed steel operating at usual cutting speed

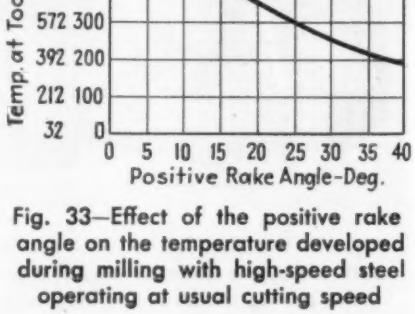


Fig. 33—Effect of the positive rake angle on the temperature developed during milling with high-speed steel operating at usual cutting speed

rake angles, are often desirable in order to obtain the initial contact between workpiece and cutter at a point on the tooth face away from the cutting edge.

The performance of face mills with chamfers is generally superior to that of face mills having teeth with square nose.

However, certain milling operations may require milling a given radius, using face mills, end mills or shell end mills. Fig. 29, for example, illustrates a channeling operation on an articulated rod. This job requires the use of an end mill having a rounded nose.

In peripheral milling cutters, the rake angle or "undercut" is generally defined as the angle in degrees giving the deviation of the *tooth face* from a radial line drawn to the cutting edge from the center of rotation of the cutter. This is the radial rake angle.

In face milling cutters, the teeth are inclined with respect to both the radial and axial lines. (See Fig. 30.) These angles are called *radial* and *axial rake,* respectively.

The radial rake angle and the axial rake angle may be *positive, zero* or *negative.* These terms are defined as follows:

1. *Positive Rake Angle*
   The rake angle is positive when the face of the tooth is displaced *back* of the radial or axial line drawn from the point of the tool, as in Fig. 30*A*.
2. *Zero Rake Angle*
   The rake angle is zero when the face of the tooth *coincides* with the radial or axial line, Fig. 30*B*.
3. *Negative Rake Angle*
   The rake angle is negative when the face of the tooth is *advanced* with respect to the radial linen drawn from the point of the tool as in Fig. 30*C*.

High-Speed Steel

Positive rake angles should be used whenever possible in all types of *high-speed steel* milling cutters. With such cutters, a positive angle improves the flow of metal along the face of the tooth, produces a superior quality of finish, increases cutter life, requires less power, and results in a lower temperature at the tool point.

Fig. 31 shows cutting tools having positive rake angles of 35 and 15 deg., respectively, in the process of forming a chip of brittle material with high-speed steel cutting tool. For the same depth of cut, the tool having a 35 deg. rake angle produces less deformation of the material being cut than the tool with a positive rake angle of 15 deg. This is indicated by the greater thickness of the chip produced by the tool having the smaller rake angle. As a result of the increased chip thickness, both the amount of power consumed by the operation and the temperature developed during cutting are greater. The effect of the degree of rake angle on the amount of power consumed and the cutting temperature developed with high-speed steel cutters operating at usual cutting speed is shown in Figs. 32 and 33.

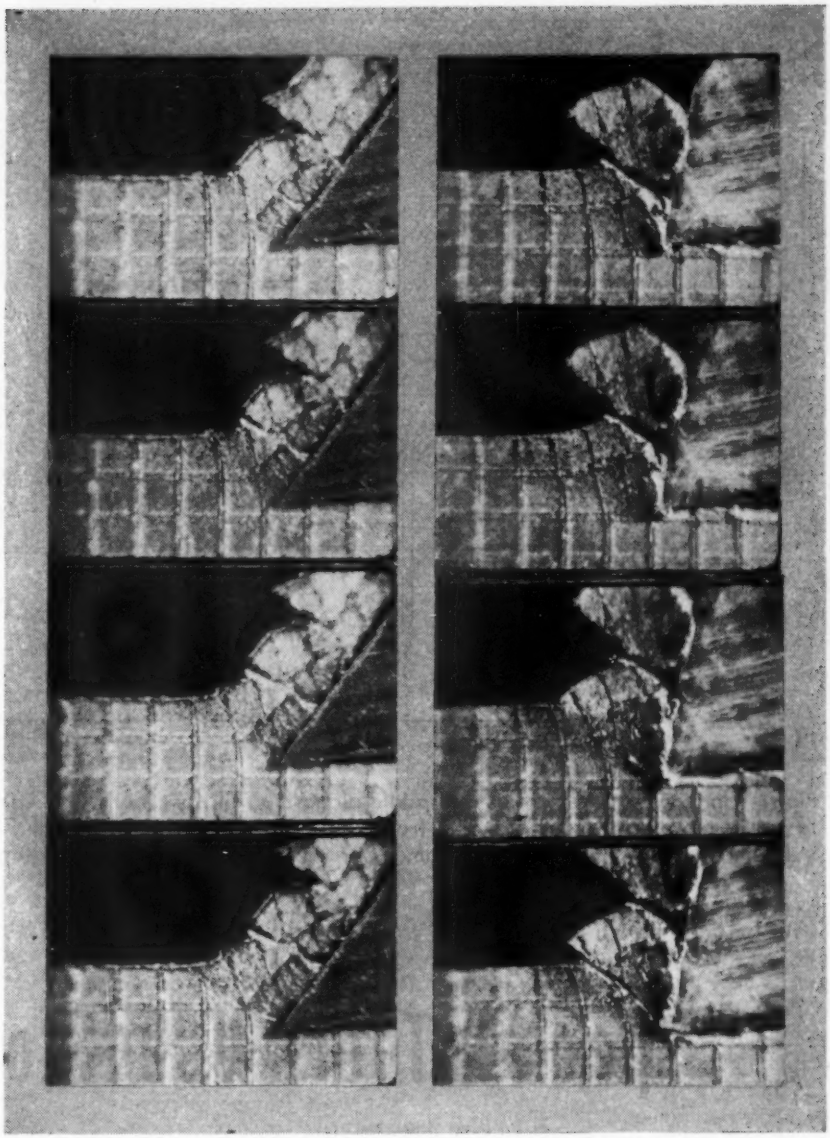


Fig. 31—(Left) Formation of a chip of brittle material with a single-point cutting tool having a positive rake angle of 35 deg. (Right) Formation of a chip of brittle material with a single-point cutting tool having a positive rake angle of 15 deg. Cross lines on the work are spaced 0.040 in. apart

Scheduled to appear in an early number, the seventh installment of this series on milling cutters will discuss rake angles for sintered carbide tools.

Speeds May Abuse Machines

BY W. O. DOWNS

THOUGH tungsten - carbide tipped tools permit work to be performed at from five to ten times the speed of the high-speed tool steel tools, care should be exercised not to abuse the machine on which they are used. When vibration occurs, the tungsten-carbide tipped tool will chip—through no fault of its own. Rather, the weakness is that of the machine which, designed with only a proper factor of safety for high-speed tool steel tools, lacks sufficient rigidity. For the sake of the machine it may be necessary to be satisfied with five times the rated capacity of the tool, or maybe less.

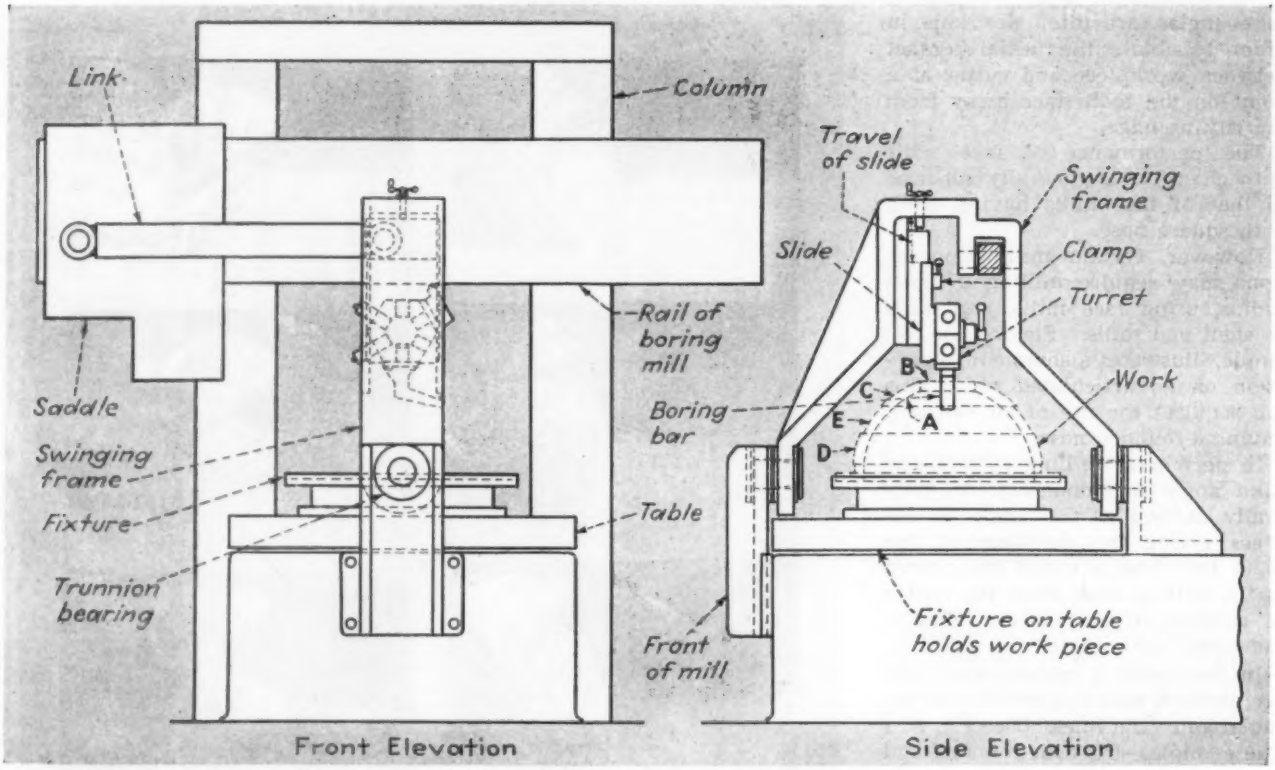


Fig. 1—Horizontal movement of the saddle along the rail, by means of a special hydraulic feed unit, is translated to radial movement of the swinging frame by means of a connecting link. The four carbide-tipped tools carried by the turret on the swinging frame, bore and turn the indicated surfaces on the work to close tolerances

Special Tools Used to Machine Spherical Fits for Anti-Aircraft Gun

Revamped boring mill and new work-holding fixtures are used to speed production of Army's powerful "stratosphere" weapon

A NUMBER of ingenious manufacturing procedures enabled the Fisher Body Division of General Motors Corporation to overcome material and equipment bottlenecks and get into production quickly on the powerful 4.7-in. (120-mm.) "stratosphere" anti-aircraft gun in the Grand Rapids Stamping Division plant. Before production could be started on this weapon it was necessary to design every tool, jig, and fixture, and many of the machines employed in its manufacture, design an automatic loader and rammer to facilitate rapid firing of the gun, make changes in specifications to facilitate volume production, train a large force of workers previously employed as press operators, helpers and assembly men on parts for automobile bodies, and build 80 percent of the machine tools used in the production of the gun.

Since the gun weighs more than 60,000 lb. and has the power necessary to fire a projectile more than eleven miles in the air, many of its component parts are of considerable size and large manufacturing equipment was required to machine them to close tolerances. An indication of the accuracy required in the manufacturing operations is the fact that only one mill variation was allowed in the barrel elevation. The precision workmanship required was made even more difficult because of the weight and bulkiness of the subassemblies.

One of the larger subassemblies on which precise manufacturing tolerances were specified is the large ball-and-socket leveling bearing on which the gun rests when assembled. This allows balancing the gun in a horizontal plane although set up on uneven ground.

The leveling bearing assembly consists of two mating parts, a large molybdenum cast iron "dome" and a large cast steel socket casting, on each of which a series of mating surfaces having a radius of 14.000

in. must be machined and lapped to a fit which shows an accuracy of 85 percent bearing when the two parts are assembled together. Accompanying illustrations show the equipment used for turning the spherical surfaces of the dome unit, for boring the hemispherical bearing surface in the socket casting, and for the lapping operation.

Special tools are employed for turning and boring the surfaces of the hemispherical dome casting. These operations are performed on a 51-in. vertical boring mill which was revamped by Fisher Body Division engineers by the addition of special tooling which eliminated one machine and saved many man-hours over the procedure originally specified for these operations. Brackets were bolted to the front of the base casting of the boring mill and on the rear of the base between the upright columns. These brackets carry trunnion bearings which support a heavy swinging frame. This frame carries a tool-slide which is adjustable to permit proper positioning of each of the four carbide-tipped tools, and on which is mounted a hexagonal turret to which the toolholders are bolted.

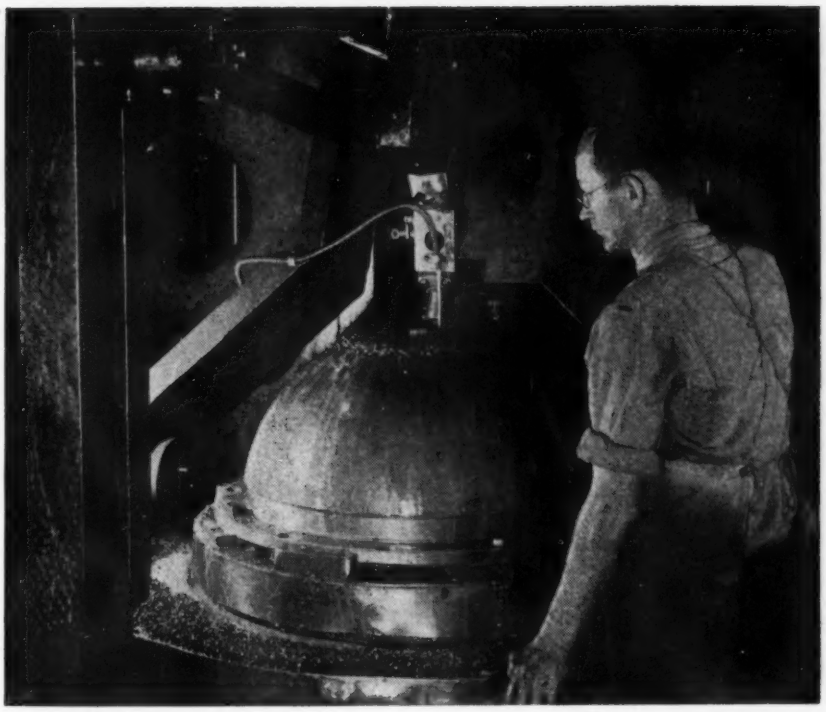


Fig. 2—A heavy radius-turning fixture was mounted on a 51-in. vertical boring mill for turning and boring operations on the dome unit of the leveling bearing subassembly. Coolant is flooded over the work during each of the four machining operations performed on this machine

The work-holding fixture on the table of the boring mill is arranged so that the work center about which the radial surfaces are to be turned and the centers of the trunnion bearings about which the frame swings are in the same horizontal plane. Thus, by swinging the frame, the tool in the cutting position is carried through the proper arc to generate the desired surface on the work. The rail of the boring mill was stripped of all equipment except one saddle, which was provided with a special hydraulic feed for horizontal movement along the rail. A heavy link having accurate cylindrical bearings of relatively large size at each end connects bearing pins on the swinging frame and on the saddle, so that movement of the saddle horizontally along the rail of the boring mill is translated into movement of the swinging frame radially around its trunnion bearings.

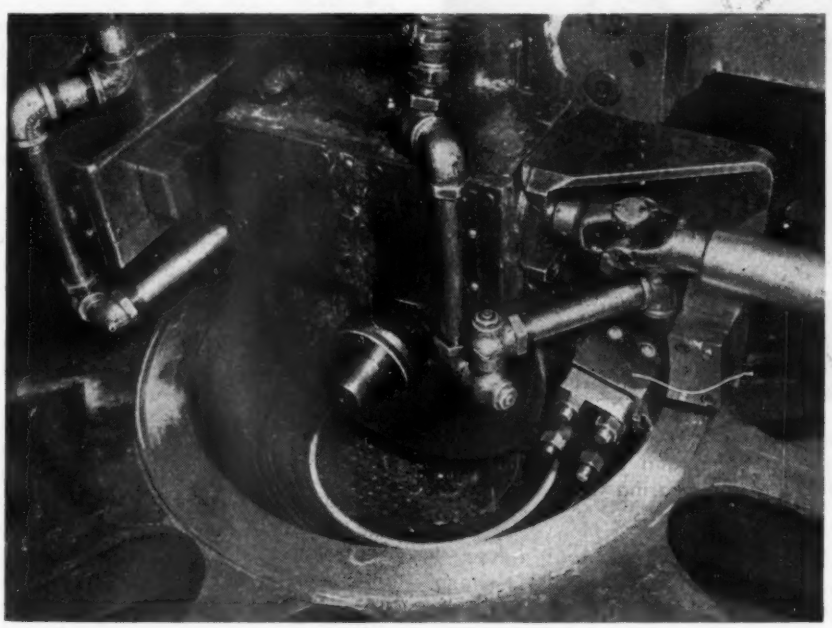


Fig. 3—Rough and finish boring operations in the spherical bearing cavity of the leveling bearing socket castings are performed on a 112-in. boring mill using a special boring head. The worm of this unit is rotated by a separate drive from the side of the boring mill

As indicated in Fig. 1, four carbide-tipped tools are carried in special holders bolted to the faces of the hexagonal turret carried by the swinging frame. The tool at position No. 1 is mounted in a special bracket which permits boring the spherical surface *A* inside the dome casting to provide a fit for the hemispherical clamp which later is assembled to this unit. The carbide-tipped tool in the holder at position No. 3 is used for boring the hole *B* while the carbide-tipped tools in holders at positions No. 5 and No. 6 turn the spherical surfaces *C*, *D* and *E*. First, the tool at position No. 5 is used for turning the entire outside area of the dome and then the tool at position No. 6 is used to undercut the area *E* to leave the two separated bearing surfaces *C* and *D* as indicated. Positions No. 2 and 4 on the turret are left open to provide clearance

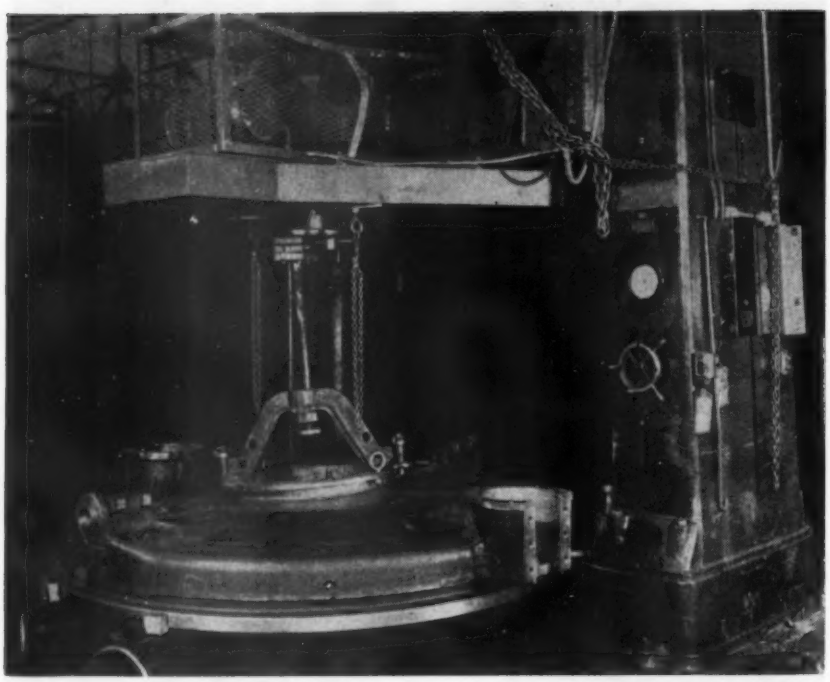


Fig. 4—A large, 1,500 ton die-spotting press was converted as shown to provide equipment for lapping the leveling bearing units together. Usually it requires 8 to 10 hr. to provide the 85 percent bearing required

Fig. 5—Radius of the finished spherical bearing is 14,000 in., plus 0.000 and minus 0.001 in. A paste-type lapping compound mixed with oil is spread liberally over the mating surfaces of the bearing for a lapping

for the boring tools in positions No. 1 and 3.

To insure accuracy of the turning and boring operations on the spherical surfaces, it is necessary that the cutting edge of each boring tool always be set on the center line of the work. Therefore, the face of the carbide-tipped tool never is ground when the tool needs sharpening. Instead, the side and end cutting edge angles are ground for sharpening.

Machining of the bottom surfaces of the large cast-steel leveling socket unit, including the boring of the spherical bearing cavity, is performed in a 112-in. boring mill made by Fisher Body. A special worm and wormwheel driven unit is employed for the boring of the bearing cavity. This operation is performed in two cuts with carbide-tipped tools. The roughing cut is made at 30 r.p.m., leaving approximately 1/16 in. stock for removal by the finishing cutter. Bits are changed in the tool holder between the roughing and the finishing cuts to insure a smooth, fine finish when the second cut has been completed. A bracket on the saddle carrying this special spherical boring head has two hardened steel blocks, one set 1/16-in. ahead of the other, for accurately positioning each bit in the holder without requiring the use of measuring instruments by the operator when setting up his tools. While rough boring the bearing cavity, the operator sets up a tool in the second saddle on the machine for facing the top of the casting around the bearing cavity. During all of these operations, the cutting bits are flooded with soluble oil coolant.

Accurate lapping of the ball and socket fits of the leveling bearing is necessary to provide the 85 percent bearing required by the specifications. This operation required special equipment and little time was available for its procurement. Fisher Body Division engineers solved this problem by using a 1,500-ton die-spotting press already available in the shop. The 50 × 86 in. slide on this press provided ample space for mounting a large frame which extended sufficiently to the front and to the rear of the press to permit lapping two assemblies at a time. At each end of this frame was mounted a variable-speed monorail conveyor drive unit set to provide a speed of 32 r.p.m. on the output shaft. Each unit was mounted so that the output shaft extended vertically below the frame.

On the lower end of each drive shaft was assembled an adjustable eccentric on which was mounted a flexible coupling and an arm connected rigidly to a bracket having clamps to fit the skirt of the dome unit of the bearing assembly. Since the eccentric could be adjusted for a throw varying from 0 to 4 in. by means of a hand knob on the end of a screw, almost any required condition of eccentric movement could be provided during the lapping operation. Operation was speeded by the accuracy of vertical adjustment provided by the spotting press.

Shop Men Give Their Ideas On Improving Machine Tools

Operators have definite views about the machine tools they use. They have been the source of valuable suggestions for increasing the efficiency of many tools. A typical example of the views of shop men who use the machines they speak about is presented herewith. The suggestions were prompted by a discussion of machine tool improvement by H. T. Johnson of General Motors Corporation

Twelve Proposals Cited

CHIP COLLECTION and removal, and a wider range of feeds and speeds are among the important factors meriting consideration in the design of new machine tools, according to the views obtained by one large manufacturing company from several of its production men. Twelve suggested improvements for machine tools, presented as a consensus of the men interviewed, follow:

1. With increases in cutting feeds and speeds, chip collection and removal has become one of the most troublesome and annoying problems in the entire janitor department. A great deal of thought should be given to chip removal from all types of machines. If possible, machines should be arranged so that chips will either slide or be conveyed out of machine into chip conveyor or chip can on the outside of the machine proper.

2. More attention should be given to design to prevent leakage and splash of both lubricating oil and cutting lubricants or coolants to outside of machine and onto floor. A well designed machine tool should not require a supplemental base pan for catching leaking oil and coolant. More attention should be given to inclosing working areas effectively.

3. It would be helpful if some sort of standardization could be made on coolant pump design which preferably should be individually motor driven with the pump and motor being one integral unit. The method of mounting the pump should be standardized and designed for interchangeability regardless of pump capacity. This would reduce the number and variety of spare pumps required, and alleviate the downtime problem.

4. Machines are handled extensively by cranes in modern plants. The machine tool builder should provide U-loops at the proper locations for attachment of crane hooks or chains. When it is necessary to wrap chains and wire ropes around equipment to move it, damage often results. Also, all machine bases should be designed with bosses or recesses to provide clearance for lifting jacks. A place should be cast or machined on machine base flange for a pry bar.

5. All medium and heavy weight machines should have leveling screws with lock nuts on base flange. Heavy precision machines should have built-in bubble level indicators on cross and length of machine to check out of level condition at all times.

6. Build machines, especially milling machines, with more rigidity and power to stand up under new milling techniques involving greater spindle speeds and feeds. A wider range in feeds and speeds for more flexible machines would be most desirable.

7. In some of the new machines that have been received within the last few years, the manufacturers seem to have sacrificed maintenance and electrical accessibility in order to obtain a more streamlined appearance. In some instances it was impossible to oil the electric motor without removing the motor from the machine. Likewise, electrical control equipment is often located in recesses or in the base of the machine so as to make maintenance extremely difficult and hazardous. We feel that the aesthetic is fine but not at the sacrifice of utility and proper maintenance.

8. Consideration should be given in designing machines for precision work to provide individual filters and built-in refrigeration with sufficient capacity to maintain the required accuracy and prolong tool life throughout the extremes of operation and temperature.

9. More standardization in the designation of machine size as between makes would be desirable to eliminate confusion. Also, lathe spindle noses should be standardized to fit stand chucks.

10. Full automatic lubrication should be incorporated in every machine where practical, and so arranged as to stop machine when pressure drops below safety point. Other points of lubrication should

be so located and designated to be located easily.

11. Hydraulic controls are desirable where variable feeds are required and mechanical controls in cases of positive and uniform feeds, especially for tappers. In designing controls, special attention should be given to their accessibility, both from the standpoint of the operator and their maintenance and adjustment.

12. Other points for consideration are lighter paint colors, especially for work areas, automatic wheel dressers for production grinders with automatic compensating feed-in of wheel slide, hardened slides and ways, electronic controls with motors requiring speed change and reversing features.

Operator Speaks from Experience

AGREEING with many other machine tool users, M. Wilenchik of Los Angeles, Calif., asserts that there is a definite need for more standardization of machine tools. Expressing the viewpoint of an experienced operator and set-up man, Mr. Wilenchik's comments on machine tool improvements follow:

1. There definitely is a need for more standardization of machine tools. Most especially is that true of the various sizes in the same type of machine put out by the same company. For example, one company puts out a standard horizontal milling machine in three sizes. If the component parts and attachments of these various sizes could be standardized, it would be possible to save a great deal of set-up time.

2. At present, speeds and feeds are entirely adequate, especially so in the production machines. Also, they are quite rugged enough.

3. I believe that the future preference for production machines will be for hydraulic feed; and for toolmaking machines, the mechanical feed. The hydraulic feed, while much faster and easier to operate is not nearly as accurate as the mechanical feed.

4. I doubt whether full electrical controls will be desirable, principally because it eliminates the "feather touch."

5. The present emergency finish on machine tools is far from satisfactory. It cracks, chips and peels easily. In the future, I believe that the trend will be for smooth (easily cleaned) dark finishes.

6. The accuracy of the present-day machine tool is about as fine as could be desired, except for laboratory or experimental work.

7. Present chip disposal arrangements are far from satisfactory, but it is difficult to see how they can be made more efficient without seriously interfering with the range and flexibility of the machine.

8. Present lubricating facilities are far from adequate, and I think that in the future general forced lubrication of the entire machine from one insertion point will be standard equipment on all new models.

9. If the ways could be hardened and ground without seriously affecting the price, it is preferred.

A.S.M.E. Member Comments

MACHINE TOOLS of higher spindle speeds than are available today are suggested by Gosta R. Truedsson, A.S.M.E. member of Holden, Mass., as an improvement which would utilize new developments in cutting methods. Mr. Truedsson's thoughts on machine tools for the future follow:

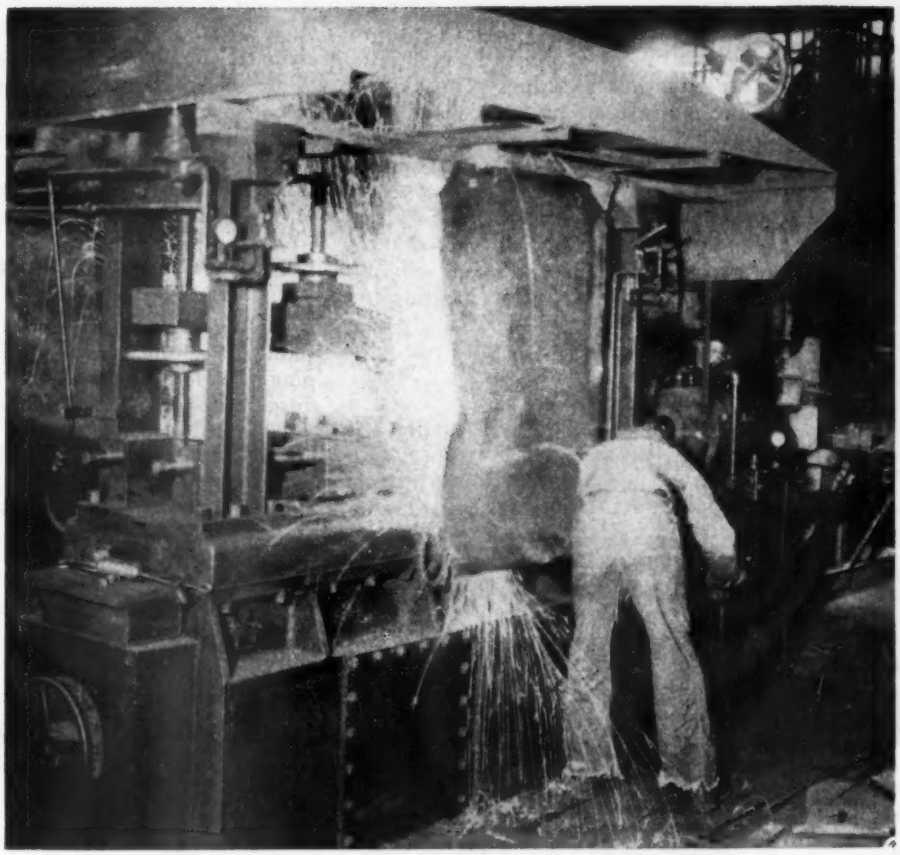
The basic function of a machine tool has always been to remove economically the greatest amount of stock in the shortest possible time, to which should be added finish requirements and efficient work handling. This has, up until the present, held the trend in machine tool development to a level not higher than the most advanced developments in cutting tools. However, to utilize fully the advantages of late discoveries in cutting methods, which have not yet found general acceptance, such as the use of negative rake carbide-tipped cutters and other tools, with a resulting decrease in the specific power consumption with increase in cutting speeds, machine tools using higher spindle speeds than anything that we have yet seen in the production line will be called for. The further advantage of using negative rake tools is that they permit a stronger tooth form, which, in combination with higher speeds to be demanded, introduce the possibilities of much greater cutting rates than our present machine tools are able to handle. That will call for more rugged machines capable of withstanding the greater stresses imposed upon them by the increase in power capacity.

It is only logical to conclude that the present trend in streamlining machine tools by inclosing their power drives in the base of the machine should not be carried to the extent the machine cannot be salvaged if trends in the near future should suddenly demand the inclusion of the features mentioned above. And such features may become of paramount importance to the machine tool builder who may some day be shown a case where his "beautifully streamlined" machine will not come within 50 percent of the performance of a competitor's less streamlined but "functionally" designed machine, installed next to it and doing the same job.

Other improvements may include better lubricating systems for horizontal and vertical slides and tables; better work spindles and boring heads to meet the demand for work of greater accuracy and finish. We may be almost certain that the "finish conscious" customer will set up certain finish specifications, whether the work actually requires it or not from a practical standpoint, and the machine tools must perform accordingly. Some large users of machine tools have already instituted research projects in the field of metal cutting, which are certain to result in specific demands upon machine tool builders.

Ball bearing manufacturers may have to come forth with some improvemnets if they do not want to see their product replaced with shoe bearings in work spindles and boring heads for jobs requiring precision and high surface finish.

"Contour boring" will, no doubt, find many applications in the future, as it has practically revolutionized certain limited fields where it is now aiding the war effort.



Behind the canvas shield (left) a composite die section is being formed by butt welding the tool steel cutting edge to machine steel backing. Section for special punch and die is laid out for inspection (below)

Composite Die Sections

SAVE TIME AND ARE ECONOMICAL

Such sections have been used extensively in the automotive field but it is anticipated that industrial applications will increase after the war

ELECTRICALLY welded composite die sections have been used extensively by the automotive industry for many years but are scarcely known outside the Detroit area. They offer many advantages which should make them loom large in the reconversion picture throughout industry.

Especially suitable for blanking dies, composite sections are fabricated by electrically welding small pieces of tool steel to mild or machine steel backing. Dowel holes can be drilled in mild steel after hardening. This eliminates the problem of compensating for over-all distortion and shrinkage of the holes, which is normally unavoidable in the hardening operation. Such distortion and hole shrinkage would make it necessary to set up the whole die again, refit the sections, and regrind the dowel holes.

Another obvious advantage is the great saving of costly tool steel. For example, if a 4-in. height for the cutting edge was needed, a 4-in. square of bar stock would be required. This would weigh approximately 54 lb. A composite section with similar cutting edge would weigh approximately 26 lb. If the bar tool steel cost 15 cents a pound and the composite section 30 cents a pound, there would be a saving of 30 cents in the initial cost of the material for a 1-ft. section, an important factor in itself.

Even more important to the automotive and other quick-turnover industries is the speed with which composites can be produced from initial drawings. Using the composite fabrication method, a blanking die for a fender has often been

Tool steel shapes are cut on an Oxygraph as the first step in the production of composite dies

completed within 36 hours, starting from scratch, whereas the planning and producing of similar dies by other methods sometimes consumes two, three, or four weeks. Composites can be manufactured with much less skilled labor than is required for the production of dies by any other process.

Another contribution to speed has been made at Allegheny Ludlum's Forging & Casting Division where 35 standard sections are stocked in five sizes each. Several tool-steel heights ranging from 1½ in. to 2½ in. are provided in each size. According to company records it has been possible to produce any desired shape of die by simply machining appropriate standard sections slightly so that they will fit together to give the desired shape.

Electrically welded composites are produced on a commercial basis by Composite Forgings, Inc., Ajax Steel and Forge Company, and Forging and Casting Division of Allegheny Ludlum Steel Corporation. The Ford Motor Company also produces them—but only for its own use. The process remains essentially unchanged wherever employed, although minor variations in practice have naturally grown up in the individual plants.

Both tool and mild steel parts, except those made of air-hardening steel which cannot be flame cut, are generally cut from slab, one at a time, on an Oxygraph. The tracing mechanism can be guided by hand around the contours of a paper templet drawn from customer blueprints and "padded" to protect sharp corners and fine projections of any sort which might be burned off during welding. This padding can be removed entirely after welding, or the part may simply be rough-machined and passed on—still partially padded—to the purchaser for finishing.

Although Oxygraph cutting is ordinarily the initial fabrication step, there is more flexibility at this stage than at any subsequent step in the process. Composite Forgings, for example, uses a Radiagraph to cut out straight pieces of backing strip, and Ajax cuts out all backing strip on a cold saw. An allowance of ⅜ in. in height is left on each piece to provide adequate "burn-away" for thorough fusion of the weld. On pieces with a cross-sectional area of over 100 sq.in., ⅝ in. to ¾ in. allowances are made.

Pieces Welded and Forged

The pieces are preheated to 1,900 F. before welding to speed fusion, reduce cracking, and facilitate chipping. Welding is done on a Swift upset butt-welder at approximately 1,100 amp., 440 volts. At Forging and Casting the pieces are held together securely in the welding machine by pneumatic clamps operated by 80 lb. air pressure taken directly from the line.

Surfaces to be joined are ground before butt welding to assure good electrical contact

Pieces are set-up in the welder jaws (below). When the jaws close, 1,100 amp. will flow through the parts and as they fuse the jaws will close further, forging them together

As the joined surfaces begin to fuse, the hydraulic upset press gradually compresses the weld at 850 to 1,100 lb. per sq.in., exerting a forging effect and forcing excess metal out as flash. When the height allowance has been consumed and the section reduced to the height called for, the press stops automatically, holding the thickness within 1/16 in. tolerance.

The section is taken from the machine, and flash is hacked away with a pneumatic chipper while it is still hot. After being allowed to cool for a short time, the sections are annealed at 1,425 F. and returned for sand blasting and whatever finishing is to be done.

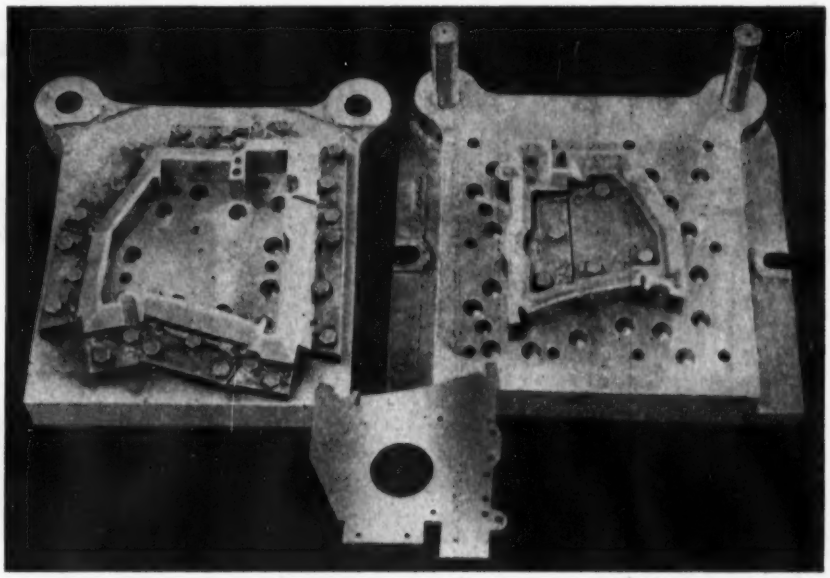
Here practice varies from plant to plant. At Composite Forgings, for example, a final cut is made with the Oxygraph after welding to give the section its required contours, thus reducing to a small amount of grinding the finish machining necessary. At Ajax Steel and Forge, on the other hand, and at Forging and Casting only a rough shaping operation is performed with a pneumatic chisel. The feeling in this case is that it is not wise to cut through the weld lest a blowhole along the line of cut deflect the oxygen jet and spoil the die.

Side Welds Are Possible

Composites can be put together with a side weld as well as the customary weld joining the tool steel to the upper surface of the mild-steel backing. Slightly more expense is involved in the side weld because it entails the use of more tool steel. Where a side weld is used, the base of the tool is welded flush with the base of the backing steel. This is advantageous in that the tool steel goes right down to the shoe and will not mush under extremely severe pressure. The use of SAE 6145 or alloy steel of similar analysis will apparently accomplish the same ultimate purpose, and the flame-hardening characteristics of such steels are not greatly different from those of mild steel.

For all dies with tool-steel sections over 3-in. in height, it is recommended that ribs or other reinforcement be added. The ribs ordinarily used are small triangular pieces of machine steel which fit into the angle formed by the weld and are arc-welded in place.

Where several tool-steel pieces are called for on a single section, they have to be butt-welded in position one at a time. It is difficult to get equal distribution of clamping pressure on several pieces with one clamp and to juggle three or more pieces of red-hot metal into perfect alignment with each other before they stick. Each successive piece of tool steel welded to one strip of backing must stand ½ in. higher than the one welded before it in order to avoid completing the circuit through the piece already welded as the weld is compressed. Or when the pieces are close together, one larger piece of tool steel can be welded to the backing and divided as necessary or practical with an oxyacetylene cut.



A completed punch and die assembled from the composite sections and showing the piece that they blank out

Practical limits on the heights of electrically welded composites are a minimum of 1 1/9-in. tool steel on a 1-in. base (or 1⅞-in. total at completion of the weld) and a maximum total of 10 in. Widths range from 3 in. to 8 or 10 in. and lengths may be up to 18 in. These figures vary with the capacity of the machines employed to produce the composites, but give a general idea of the size that individual sections may reach.

Welding of Fractured Annealed Tool Steel

By ARTHUR HAVENS

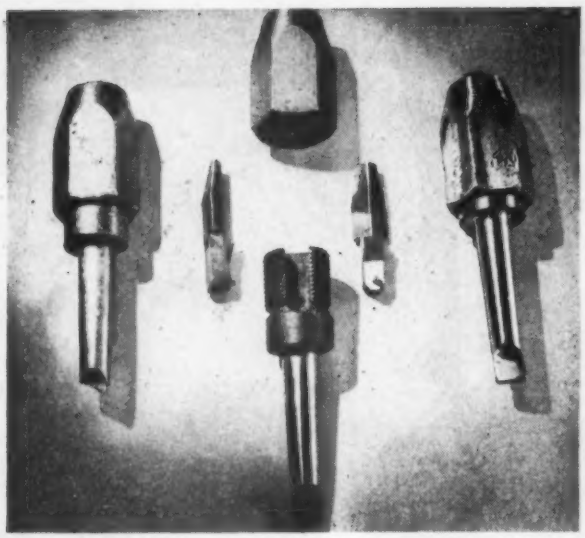
SUCCESSFUL WELDING of the fractured annealed tool steel pressure arm of a German-made nibling press, in the Howe Scale Company, returned the machine to operation without serious delay and circumvented waiting for an entire new, American-made machine.

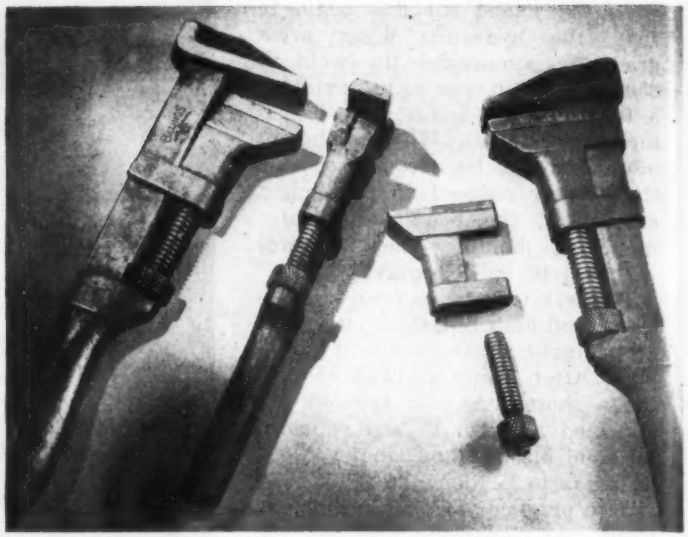
When a fracture started beneath a bearing lug and ran off at an angle toward the top, for some five inches, the general foreman called in a welder to attempt to mend the crack.

He gripped the part in a heavy vise, heated the area at the end of the fracture a bright red and, with added pressure on the vise, closed the crack completely. With the part held securely in the vise and using a cutting torch he carefully V'ed out one half of the break. The next step was to heat this all over and weld the break.

When welding tool steel, each drop of added filler metal must be applied into a molten pool: if the operator attempts to work the metal around as in mild steel welding, he will not only destroy the carbon contact of the tool steel, but will so badly burn the metal that it will be useless. A carburizing flame is needed with about a half-inch feather of acetylene. An ossacional touch of cast iron flux added to the tip of the red hot carbon steel welding rod will help to dissolve surface oxides.

Following this procedure with meticulous care, one side was completed. The opposite side of the part was then V'ed, care being taken to remove all the crack, after which it was welded, same as the other side. After this the entire part was again heated all over and left to cool to room temperature.

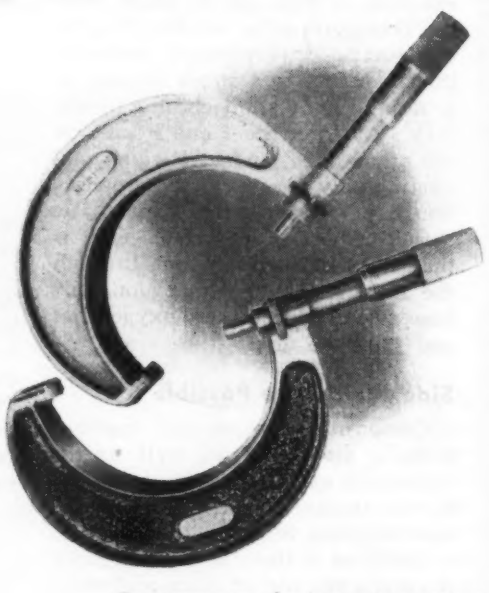




Broken drill chucks are reclaimed by turning down the shank and collar to obtain additional length. If the break is near the center a new shank is used with the old shell. On badly worn chucks new jaws are inserted and the shell reconditioned. Wrench troubles usually involve failure of the jaws. New parts are provided when necessary and broken parts are welded or brazed. When the jaws of pipe wrenches become filled with dirt they are filed clean

Tool Conservation Is "Good Business"

BY P. M. MATTHEWS AND J. P. KEENAN,
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY



Constant use of micrometers at approximately the same setting causes threads to become worn in one spot. In such cases threads are rechased and lapped, the spindles are straightened and the anvil replaced. A crackle paint finish and polishing complete the renewal

TODAY and for some time to come it will be difficult to obtain any new shop tools and even when they are obtainable much time will pass between the order and actual shipment. Tool conservation, therefore, has become of great importance in the "battle of production." This has been recognized by the Westinghouse organization and two main conclusions have been reached.

1. It is "good business" to get maximum life out of tools, not only because the "squeeze" is lessened on scarce raw materials, but because maximum life cuts costs, relieves the current heavy burden of the tool manufacturers and at the same time assists in maintaining production schedules.

2. It is also "good business" to teach workers how to use tools properly, so as to get the most out of them. It is recognized that bad habits in the use of tools are hard to break.

Among tools which offer good salvage and renewal possibilities are files, hammers, wrenches, power hacksaws, blades, mallets, welding apparatus, vises, blowtorches, gages, micrometers, hatchets, drills, cutters, taps and drill chucks. All tools requiring repair or renewal of parts are sent to one department which is closely allied with the toolroom. After reconditioning they are returned to the department where they are used.

Everything possible is done to restore them to their original condition when purchased. This reconditioning consists of sandblasting, cleaning, polishing, painting, oiling, adjustment and replacement of such parts as may be necessary. The objective is to place in every worker's hands tools which are in the best possible condition and it has been determined that the favorable psychological response on the part of the worker is much greater in the case of a renewed tool than would have been true if the tool had merely been repaired.

Workers are made conscious of the value of tool conservation by posters and signs about the plant, especially near toolrooms. Foremen and toolroom attendants are taught the necessity for conserving tools, are advised when to turn them in for renewal and are directed to pass on such information to all workers they contact.

New Designs of Plastic Mold Ejector Pins Reduce Failures

BY HARRY G. WESSEL, WESTINGHOUSE AIR BRAKE COMPANY

Close-fitting and well-aligned ejector pins of thermoplastic molds keep themselves clean of molding material, eliminating binding and frequent breakage

FAILURE of ejector pins, one of the most common causes of press shutdowns during compression molding of thermosetting plastic parts, has been practically eliminated by improved methods of mounting the pins. Such failures occur most frequently in multiple-cavity molds used on automatic or semi-automatic presses, where the number of molding cycles per day are numerous. They are usually caused by pins sticking and breaking, as a result of thin layers of molding compound entering the clearance between the pins and surfaces of the holes in which the pins are set. The slightest misalignment of the pins requires extra clearance to allow them to function properly, and troublesome film accumulates at each molding cycle until failure takes place.

A typical example of a misaligned pin, somewhat exaggerated, is shown at Fig. 1. In such cases the pins do not clean themselves as readily as close-fitting pins in good alignment and tend to wear the hole out-of-round, which further aggravates the condition by allowing an excess amount of film to remain in the hole.

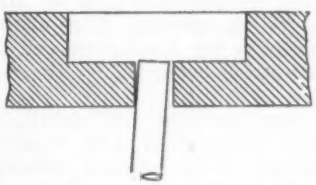


Fig. 1—Ejector pins aligned improperly require more than average clearance which allows a heavy film to accumulate around them, causing them to stick and break

This excess material continues to pack around the pin until it causes the pin to bind so tightly that it eventually breaks, causing a shutdown of the molding press until replacement can be made. This usually means the removal of the mold from the press for repairs, with consequent loss of production.

Several designs of ejector pins and methods of mounting them on knockout plates or bars to eliminate misalignment and consequent sticking and breakage have been developed and have given good results over long periods of service. They can be adapted to most types of presses of standard construction. The illustrations show all pins mounted for bottom knockout bars, but they can be mounted for upper knockout bars when necessary to eject the part from the upper part of the mold.

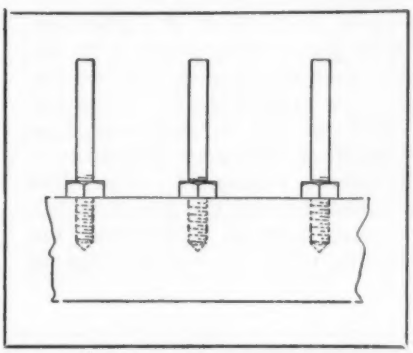


Fig. 2—The threaded ends of pins are usually screwed into tapped holes and locked in position with nuts. This method requires accurate spacing and tapping of the holes in order to avoid misalignment

Ejector pins are usually mounted in the knockout plate or bar by screwing the threaded end into a tapped hole and locking it in position by a nut, as shown at Fig. 2.

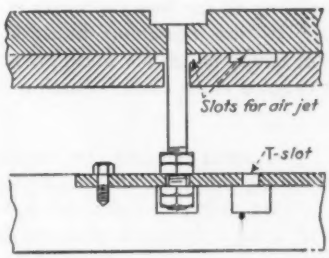


Fig. 3—Material that works down around the pins may cause jamming in the mold. Slots should be provided in the mounting plate for blowing out this surplus material with compressed air jets controlled by the action of the press

This method requires accurate spacing and tapping of the hole in the knockout bar when a series of pins are used and also requires accurate threading of the pin itself. The spacing must match accurately with the holes in the mold, thus requiring the services of a highly skilled toolmaker. Even then pins so mounted will usually show some misalignment at the points farthest away from the ends screwed into the knockout bar. They must then be deflected in order to enter the matching holes in the mold and being under tension they either break or gall in the holes after short periods of operation.

The various designs of ejector pins and the method of mounting shown in the illustrations provide a floating or self-centering effect and require less skill and precision workmanship to produce them. This work can be assigned to workmen other than skilled toolmakers, freeing toolmakers for work on more intricate parts of the mold.

A well-centered pin with minimum clearance in the hole, smoothly finished and polished, reduces the thin film of molding compound which can enter the space between the pin and the hole and tends to clean itself at each stroke of the

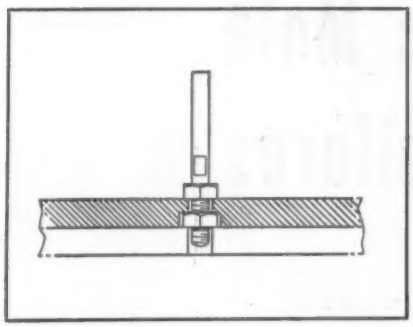


Fig. 4—A knockout bar made in two parts with just enough clearance for a sliding fit for free centering in relation to the matching holes is used for cavity molds for small parts that require close center spacing

press. Provision should be made for removing any of the material which works down around the pins as it will gradually pack and result in jamming the mold. This is accomplished by providing slots in the mounting plate below the mold, as shown at Fig. 3 and blowing out surplus material by jets of compressed air at each stroke of the press.

The design of pin and mounting shown at Fig. 3 compares with a bolt in a T-slot. Ample clearance in the slot should be provided as the pin is guided entirely by its matching hole in the mold, without any binding or deflection. Replacement of a damaged or broken pin is a simple operation as the knockout bar can be moved out of position and a new pin inserted without removing the mold from the press.

The knockout bar is made in two parts to facilitate the machining of the T-slot. The lower portion has slots shaped through its upper edge and a plate with milled slots is bolted on this face to form the completed T-slot. The nuts, locked in a predetermined position on the ejector pins, are spaced with just enough clearance between them to permit a sliding fit on this upper plate. The ejector pin is free to center itself in relation to the matching holes in the mold.

A variation in the construction of this type of ejector pin and mounting is shown at Fig. 4. This design permits centering the pin in its proper location and then locking it in position by tightening the upper nut. It also permits easy adjustments for length by turning the ejector pin in the lower nut. A flat is milled or filed on the pin just above the locking nut to facilitate turning the pin for this adjustment. All the nuts are faced square with the threads and are of uniform thickness.

This mounting is made in two parts, the upper plate having a slot machined at least 1/32 in. wider than the flats of the nuts used and 0.003 in. deeper than the thickness of the nut. Holes 1/32 in. larger than the pin diameter are drilled through both plates, the holes located to match the ejector pin holes in the mold cavity. Both plates are then fastened together as a unit by the use of cap screws. This type of pin mounting is used for multiple-cavity molds for parts of small size requiring close center space.

For molded parts of a thin flat section requiring more than one pin on each part to prevent distortion when the part is ejected from the mold cavity, a construction as shown in Fig. 5 is used. This type requires ejector pins of a predetermined exact length, turned with a head or collar on the lower end.

Slots are machined through the upper edge of the knockout bar to accommodate a plate in which the nest of pins is mounted. The pins so mounted are floating or self-centering as the holes in this plate are drilled and counterbored 1/32 in. larger than the diameter of the pin size. The head or collar of the pin is 0.003 in. less in thickness than the depth of the counterbore to permit lateral movement. The slots machined through the knockout bar are made 1/16 in. wider than the mounting plate to permit aligning and are fastened in position by a cap screw through the bottom of the knockout bar after the ejector pins have been centered in the holes in the mold.

Each of the foregoing methods of mounting ejector pins has definite advantages. The type used is determined by the size of the molded parts, their shape and thickness and by the center distances permitted in the mold design. Since the cost of the mold is part of the production cost of parts, continued trouble-fee operation more than offsets the slight additional time spent on the initial construction of what might appear a minor detail.

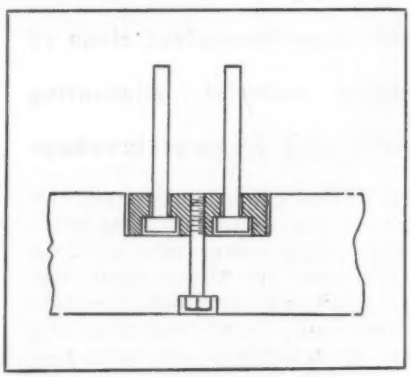


Fig. 5—When molded parts are thin flat sections requiring more than one pin on each part to prevent distortion while being ejected from the mold, a special type of mold is used which requires ejector pins of predetermined length, with a head, or collar, on the lower end

Good Catalogs Sell Machines — Discussion

BY MAURICE SCHAPIRO, ADVERTISING MANAGER
THE CINCINNATI PLANER COMPANY

WHILE SPEED may be essential in layout of a rush government project, the selection of equipment by the layout man is rarely ever done and if so should not hinge upon whether manufacturers' catalogs do or do not include baseplate plans and extremely detailed electrical equipment specifications.

After all, some attention should be paid to the quality of the machine and the work it will perform.

When a machine tool is purchased from us, the customer is furnished with a certified foundation plan which will give the exact floor dimensions and full details for foundations which our machines require.

To include such information in our catalogs would make them very bulky as floor plans would necessarily be shown for many sizes of machines.

In practice machine tools are ordered in infinite variation of sizes and special equipment, which always changes both the floor plan and the over-all space occupied by the machine.

We now provide full details of electrical equipment and machine dimensions in our newer catalogs, and believe this forward step is a great help to machine tool buyers and industrial engineers. To go further and include exact floor plans and bolt-hole layouts appears impractical for large machine tools.

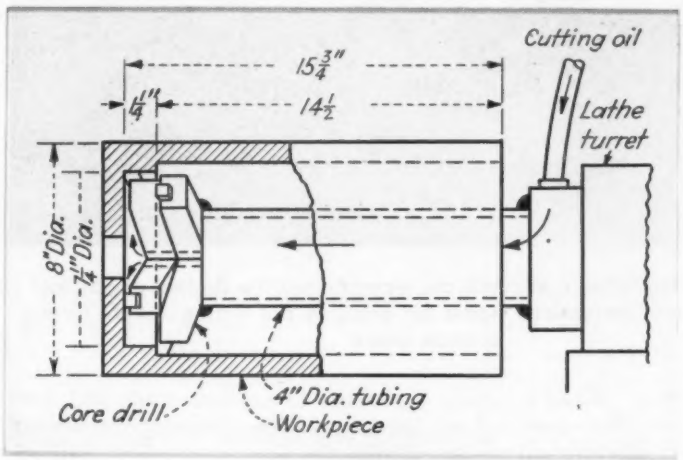
Practical Ideas

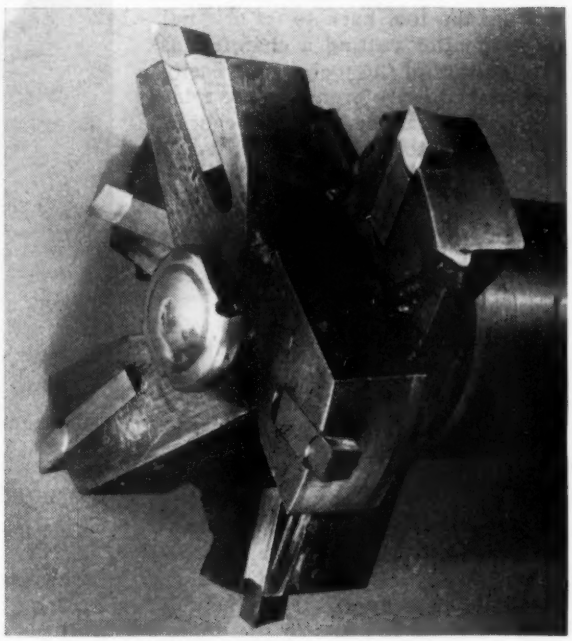
War-Winning Suggestions appearing here were recognized as meritorious by the Board for Individual Awards, War Production Drive, and the Navy Employees' Suggestion Program. They are offered to industry to aid in war production

Two-Diameter Boring Tool Fabricated Cheaply by Welding

BY V. HARISAY

Dominion Engineering Works. Ltd., Longueuil, P.Q., Canada





Stepped diameters at the bottom of a part can be machined economically with a cutter fabricated by welding from flat stock and tubing. Right, welded gusset plates between the toolholders add rigidity to the boring tool

A boring tool that cuts two diameters at one time has been designed and is satisfactory and in regular use at this plant. It replaces an elaborate and expensive boring head used formerly for this class of work. The duplex tool and a typical job done with it are shown in the illustrations.

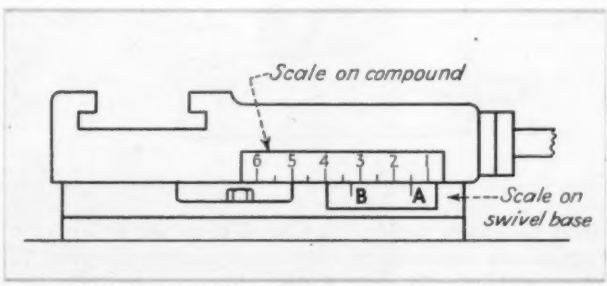
The tool is of all-welded construction, a piece of seamless Selby tubing 14½ in. long and 4 in. in diameter being used as an arbor and also serving as a conduit for cutting oil. One end of the tubing is welded to an adapter which fits the lathe turret. At the other end are six toolholders, made from 1¾ × 1⅜ in. SAE 1020 flat steel. These toolholders are reinforced by three ¼ in. gusset plates. The tool is sturdy and rigid and the fabricating cost is small. Standard toolbits may be used with the tool, replacing the more expensive types with serrated blades used generally.

Two Graduated Scales Facilitate Use of Compound Rest

BY DONALD R. TRYER

Two graduated scales attached to the compound rest and swivel base of an engine lathe have facilitated the use of the compound slide when cutting bevels and chamfering, in connection with boring, facing and turning on a production basis. As shown in the attached illustration the scale on the compound slide was laid out with graduations ¼ in. apart, which equals two complete turns of the compound leadscrew on the lathe being used. The scale on the swivel base was laid off with two lines ⅞ in. apart, so that if line *A* on the latter coincides with a line on the upper scale, line *B* will be just half way between two lines. One complete turn of the leadscrew will align *B* with a mark on the upper scale.

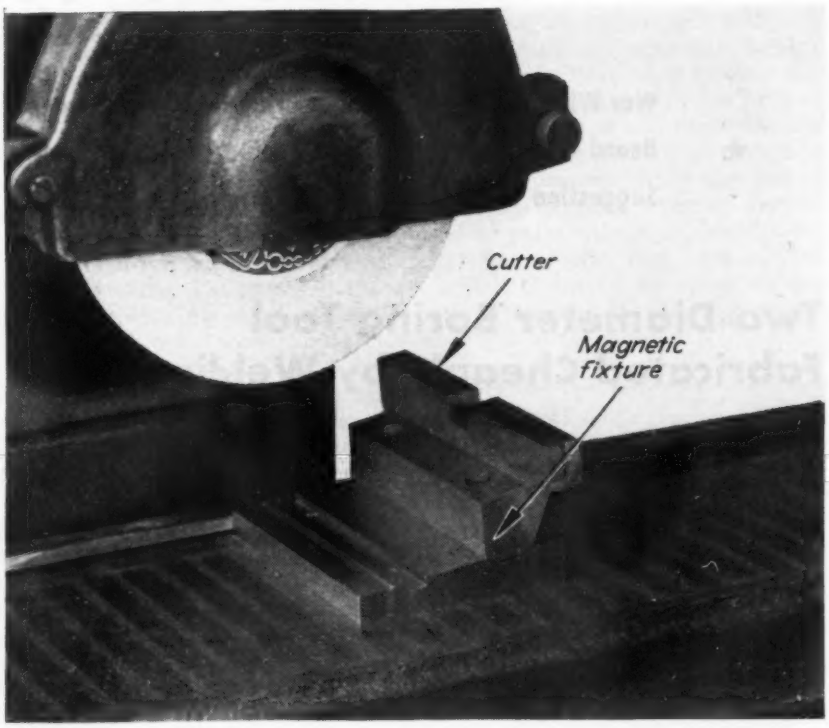
The two scales were laid off on



Two scales mounted on an engine lathe speed up production materially when cutting bevels or chamfers in connection with boring, facing and turning operations

pieces of sheet brass, which were fastened to the compound slide and swivel base with flatheaded countersunk machine screws. It is necessary that the two lines coincide when the micrometer dial is at zero in order to insure accuracy in actual machining.

Use of these scales in lathe work eliminates the necessity for counting the turns of the leadscrew when moving the tool back to its original position after cutting a chamfer, as the position of the tool can be easily determined by reference to the relative position of the lines. Of course, the micrometer dial must be used to set the tool exactly.



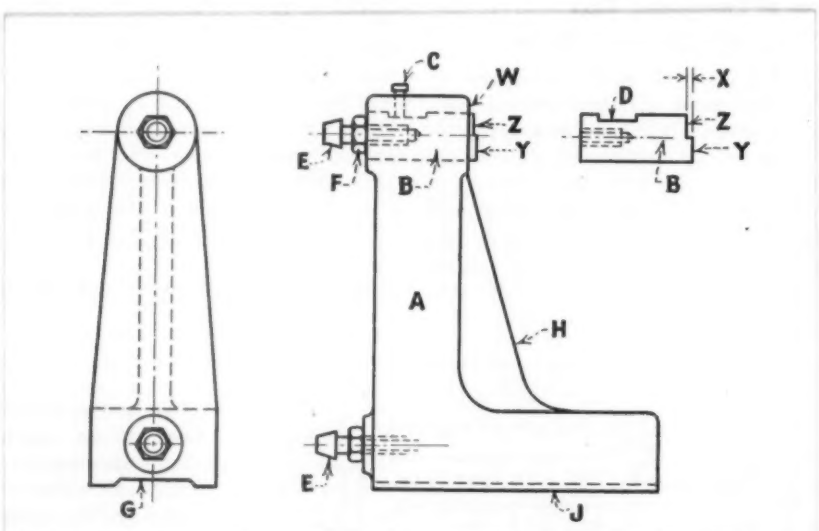
Magnetic holding fixtures, in which are incorporated the desired angles, provide a quick and convenient means for grinding flat boring cutters having carbide inserts

Magnetic Chuck Facilitates Grinding of Flat Boring Cutters

BY DAVID H. LIST
Washington Navy Yard

Magnetic holding fixtures, in which are incorporated the desired angles, provide a quick and convenient means of grinding flat boring cutters having carbide inserts. These fixtures are angular plates suitably slotted to receive a tongued strip for backing up the cutters while being ground. The backing strips are held in place by screws.

The plates have face angles of 5 and 7 deg. to accommodate cutters with various angles. The cutters are firmly held in place by magnetic force, without clamping, during grinding operations. When grinding is completed a switch is operated to cut off the supply of electrical power to the chuck, and the fixture can then be unloaded and reloaded quickly. The use of magnetic chucks in these grinding operations has resulted in time saving which amounts to between $400 and $500 per year. *War Winning Suggestion Under the Navy Employees' Suggestion Program.*



Accuracy of right angles on rough castings can be determined easily by a flush-pin type gage which can be made to check within plus or minus 10 min. of a 90 deg. angle

Flush-Pin Gage Quickly Determines Accuracy of Casting Angles

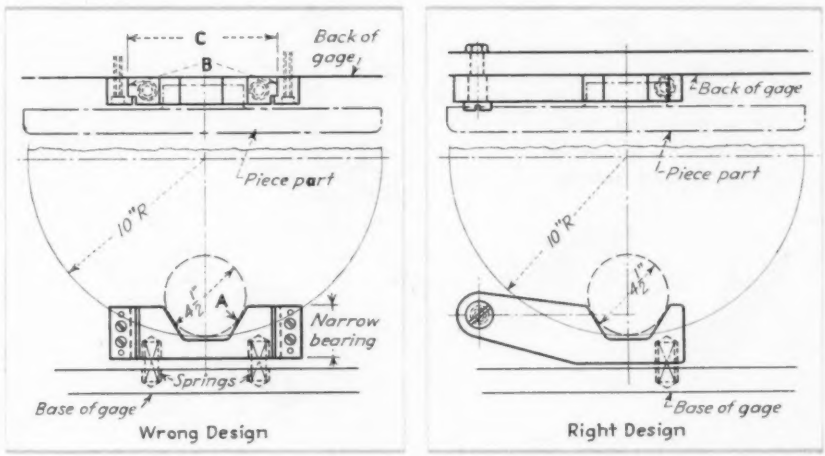
BY ALEX. S. ARNOTT

To gage rough castings for a right-angle measurement within specified limits, the gage shown gives a quick and positive indication of the accuracy of such angles. The gage is of the flush-pin type, and with reasonable care in construction it will measure within plus or minus 10 min. of a 90-deg. angle.

The body, *A*, is made of gray iron and is ribbed at *H* to assure good alignment between the base and the right-angle column. The base is machined at *J* and is relieved at *G* to give the gage a positive resting surface. The sliding block, *B*, is a snug fit in the bored hole at the top of the column. A keyway at *D* is engaged by the setscrew *C* to prevent the sliding block from turning. A tapped hole is provided for the feeler *E*. The ledge is ground so that dimension **X** is equal to the

desired limits required on the work, and its accuracy is important to maintaining proper gaging. The pins, *E*, are hardened and ground to give good wearing qualities and both are adjustable to suit the work. Lock nuts, *F*, hold the pins in position after they have been set in place.

In actual use the gage is brought up to the work to be inspected, the lower pin *E* coming into contact with the work first. The upper pin, which does the gaging, is then brought into play by moving *B* in or out. If the angle of the work is exact the two pins *E* will be in line with each other and the ground ledge will extend halfway out from the face of the boss *W*. If the angle is not true, but within the specified limits, the face *Y* will not be below the boss *W* nor will face *Z* extend out from *W*.



Cocking of the boss-centralizing gage under the weight of the casting is avoided by pinning the arm to the body of the fixture

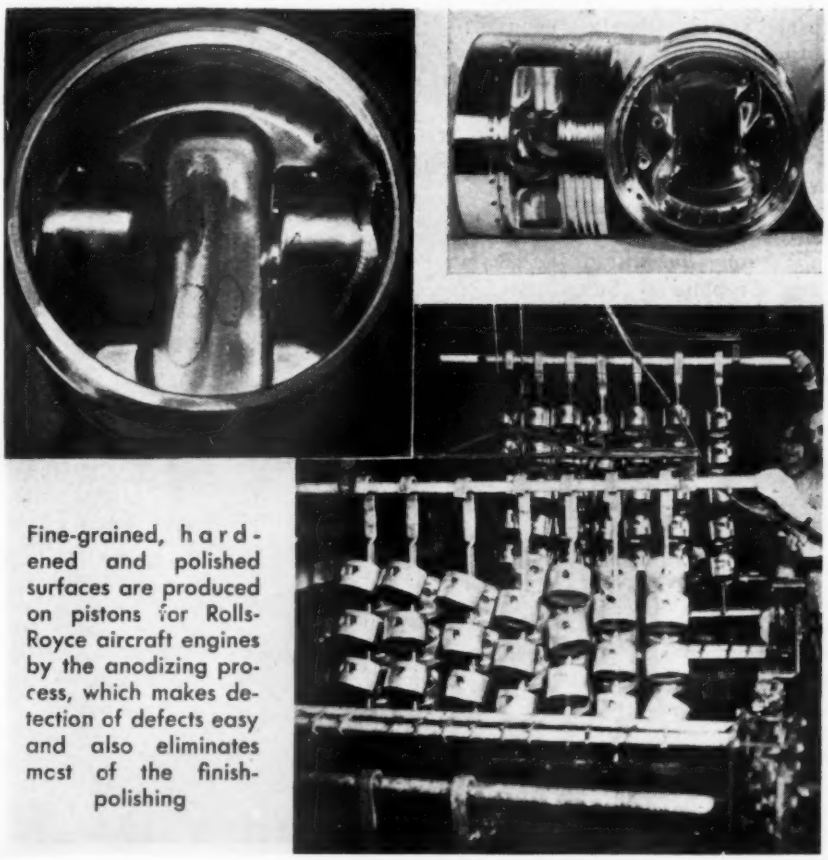
Gage Accurately Checks Location Of Bosses and Cores in Castings

BY M. W. BOSSMAN

A gage designed for checking the locations of bosses and cores in rough castings is shown in Fig. 1. It was intended to centralize the casting, as well as to locate the 4½ in. diameter boss on the vertical center line. Fig. 1 does not show the centralizing method, or the balance of the design, as it is intended only to explain the difference between good and bad design in locating the 4½ in. boss on the vertical center line.

In Fig. 1 the bearing *B* is too narrow in proportion to the length, *C*. The weight of a part setting on one side of the V on part *A* will cock the end bearing of *A* against the rail *B* and stick and therefore will not function as intended.

The design of the gage did not allow for lengthening the bearing *B* and the design was therefore changed to that shown in Fig. 2. This form of gage will not stick and can be depended upon to function properly at all times.



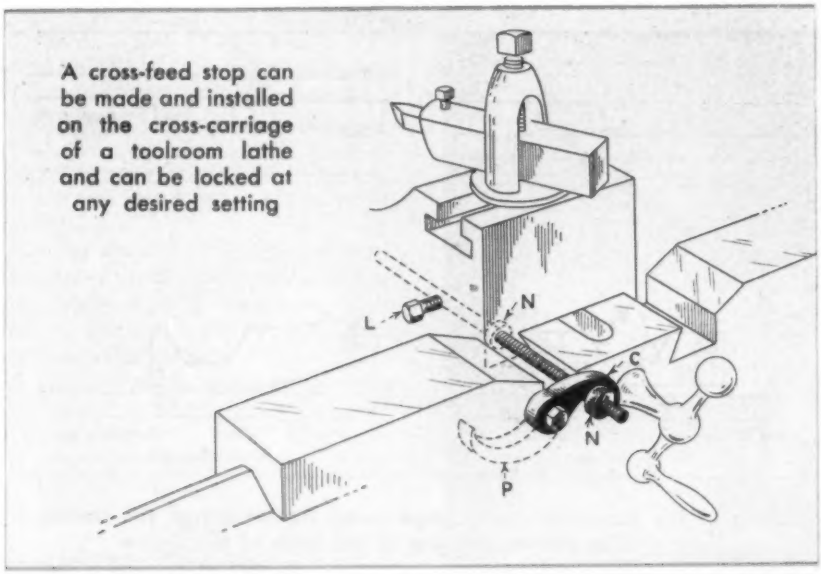
Fine-grained, hardened and polished surfaces are produced on pistons for Rolls-Royce aircraft engines by the anodizing process, which makes detection of defects easy and also eliminates most of the finish-polishing

Anodizing Pistons Eliminates Finishing, Reveals Defects

BY FOSTER ISAACS
Packard Motor Car Company

Specifications on pistons of Packard-built Rolls-Royce aircraft engines, shown in Fig. 1, require a highly polished surface, with all scratches and tool marks removed after machining. Such a finish permits easy detection of porosity, sand holes or fractures. The time required to hand-finish one piston is 45 min.

An anodizing process was added after the rough-machining and rough-polishing operations to show up all imperfections and to eliminate a considerable amount of the finish-polishing operation. This process has a shrinking effect on the outer surfaces of the parts and produces a fine-grained, hard surface, while obliterating small tool marks and scratches. If these scratches, or other defects, such as porosity, sand holes or fractures are present, the anodizing process has the facility for showing them up by off-color markings. Then the part is repaired



A cross-feed stop can be made and installed on the cross-carriage of a toolroom lathe and can be locked at any desired setting

or scrapped before polishing operations are performed. With the anodizing effect it is necessary only to finish-polish the surfaces.

As defective parts average 20 pieces a day, because of casting defects, approximately 23 hours a day are saved. The annual saving in time through the adoption of anodizing is approximately 116,700 man-hours a year, releasing 40 men for other work. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Rivet Heads Removed Without Damage to Aircraft Surfaces

BY R. S. SHAW

Naval Air Station, Moffett Field, Calif.

A tool for removing the heads of rivets used in aircraft construction without damaging the surfaces and without causing undesired enlargement of the rivet holes has been devised and is in regular use at this station.

The tool is a two-lipped cutter, suitably housed in a cylinder which is knurled on the outside to provide a firm grip for the operator. The cutter is locked in a drill chuck and can be adjusted for any desired depth of cut. When a rivet head has been removed the feed of the cutter is automatically stopped when the housing comes into contact with the surface around the rivet head. Adjustment of the cutter head is accomplished by means of locknuts.

Use of the tool has eliminated the undesired enlargement of rivet holes so often experienced when removing rivet heads from angular surfaces or channels and has also conserved aircraft skin material. *War Winning Suggestion Submitted under the Navy Employees' Suggestion Program.*

Cross-Feed Stop For Toolroom Lathes

BY GEORGE HOLMAN

When a lathe is not equipped with a stop for adjusting the cross-carriage to a desired setting, such as a toolroom lathe, an attachment can be built into it which will serve the purpose, as shown by the illustration.

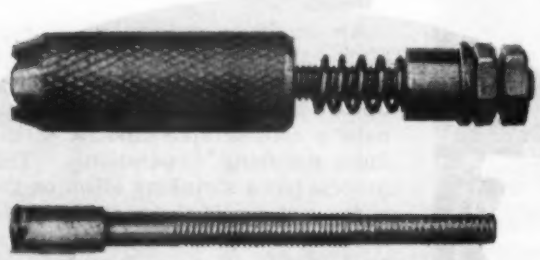
It is necessary to drill a hole, preferably ½ in. in diameter, lengthwise into the cross-carriage. A threaded rod of the same size is inserted and held in place by a lockscrew, *L*. When the stop is to be used the lockscrew is loosened, the rod pulled out and locked in position, as shown by the dotted lines. Adjustment is made by the small knurled nut, *N*, which fits against the pawl, *C*. The neutral position of the pawl is shown at *P*.

Cutting Multiple Threads With Gears Engaged

BY JOHN M. GANEZ

Following is a method for cutting multiple threads without disengaging the gears and turning the spindle, or of having a faceplate with exactly spaced slots. The compound slide should be set at 45 deg. and the graduated dial of the screw of this slide at zero. The cross-slide feed screw is set for the depth of thread desired.

After the first thread is cut to proper depth, the reading on the cross-screw dial should be noted, after which the compound slide should be moved to the right ½, 1/3 or ¼ of the lead of a double, triple or quadruple thread, respectively.



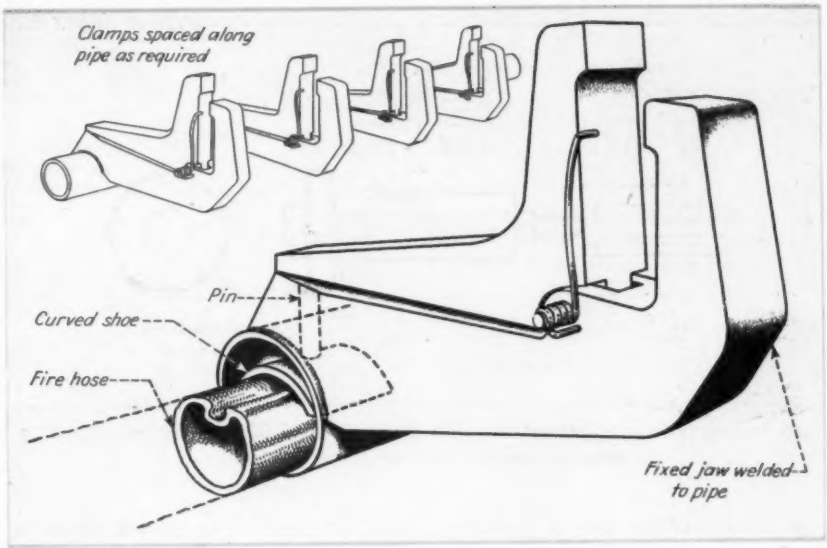
Cutting action of the tool is stopped automatically when it contacts the surface from which a rivet head has been removed

Correct distance to move the compound slide is accomplished by calculating the hypotenuse of a right-angle triangle, with arms equal to ½, 1/3 or ¼ of lead. With the hypotenuse determined and the screw of the compound slide turned the proper number of thousandths, the threading tool is in position for starting the next thread. For the proper depth of second thread add the length of the arm of the triangle to the former dial reading on the cross-feed screw. The threading tool is similarly adjusted on additional threads.

Air Pressure for Multiple Clamping Supplied Through Fire Hose

BY PETER KETELSEN
Boeing Airplane Company, Wichita Division

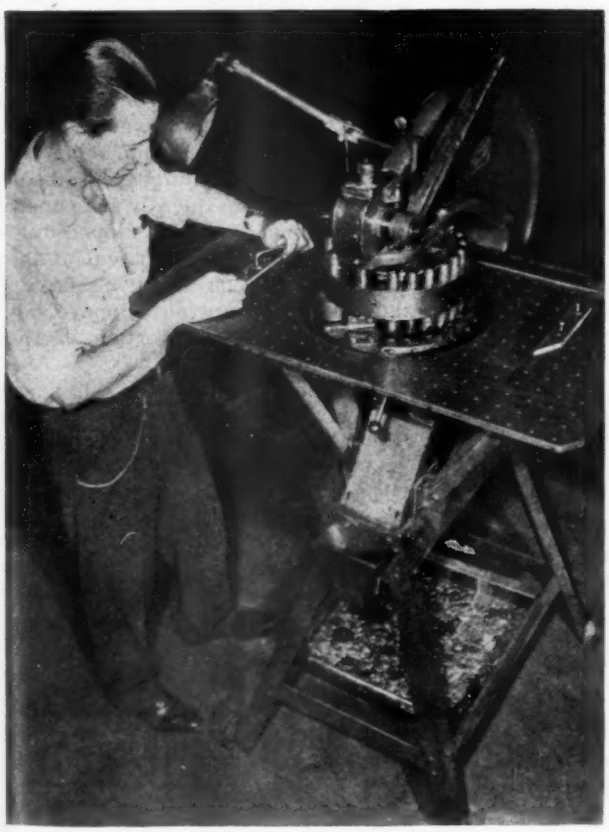
Manufacture of large airplane structures frequently requires the design of long fixtures for the production of major assemblies. When the parts have been assembled in such a fixture, it is necessary to clamp them in position for drilling, riveting and other operations. Quick-acting clamps are desirable in order to reduce the time necessary for setting the work in the fixture.



Flexibility of fire hose is utilized to operate a multiple clamping device for holding long aircraft parts in assembly jigs. Air pressure closes the jaws and they are opened by springs when the pressure is released

For this purpose, individual air cylinders frequently are used, with all of the clamping cylinders in a group being operated from a central control valve.

A recent development in multiple pneumatic clamping for such aircraft fixtures made at the Wichita Division plant of Boeing Airplane Company is shown. A series of small two-jaw clamps are welded at intervals along a pipe section, which can form one of the structural members of the fixture. Inside this pipe is a length of standard fire hose which, when inflated, forces the clamp shoes inside the pipe upward, thus moving the pivoted jaws of the clamps against the work. A heavy coil spring holds each pivoted jaw open when air pressure is released from the hose.



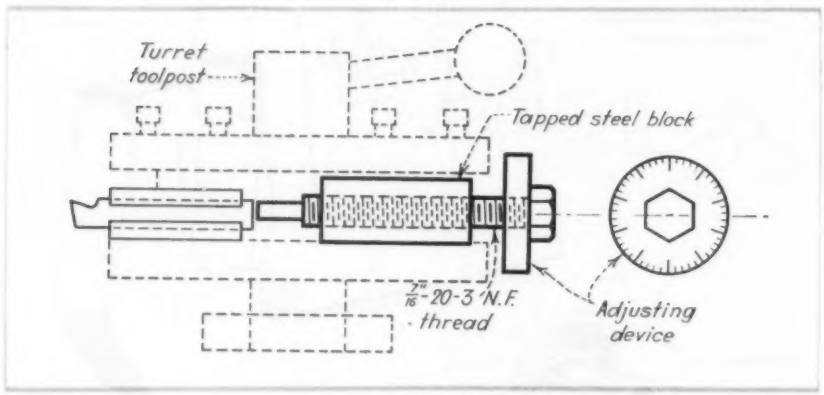
The handling and operating time of a rotary punch has been reduced approximately 60 percent by a combination locating table and guide plate

Work-Locating Table for Rotary Punch Reduces Handling Time

BY C. A. CLARQUE
Northrop Aircraft, Inc.

A combination work-locating table and guide plate for a rotary gang punch acts as a support for large pieces, or as a handling platform for smaller ones. The locating and handling of large parts is difficult on the punch for one man, and the operations were formerly confined to center punching the part by means of a templet and then drilling the required hole.

The platform has locating holes drilled in it according to most convenient spacing, say 2 in. on centers. Guide bars can be pinned or bolted to the platform at the desired holes, with the aid of a templet. Then the piece is merely butted against the



Two facing tools can be set to limits as close as 0.001 in. by an adjusting device mounted on the turret toolpost

guide bars and the hole is punched. Matching of the templet to the part for hole location and subsequent drilling are no longer necessary on flat stock. In working contoured parts the guide plate was designed in two sections and can be unlatched at the center and pivoted on its supports to clear the punch.

A minimum saving of five to ten seconds per hole has resulted in an estimated 60 percent reduction in handling and operating time and the value of the unit as a production tool has been increased materially. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

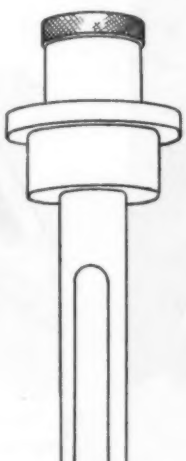
Micrometer Adjustment for Facing Tools in Lathe Turret

BY DONALD R. TRYER

When using the turret toolpost on an engine lathe it is necessary at times to adjust two facing tools within close limits. A device was developed for making this adjustment and after some experience, it was found that adjustments could be made as close as 0.001 in.

A small steel block, about ¾ in. square and about 1½ in. in length, was drilled lengthwise and tapped for a 7/16-20 NF thread. It was necessary that the hole be drilled in alignment with the end of the cutting tool. A ½ in. hexagon bar was turned down and threaded with a 7/16 in.-20 NF thread, so as to make a Class 3 fit in the block. A small bronze disk about ¼ in. thick and 1½ in. in diameter was drilled and tapped and run up against the unturned end of the hexagon bar, a small unmachined portion of which was left so that a wrench could be used to turn it. The disk was divided into ten graduations and subdivided into five more, making a total of 50. As the pitch of the thread is 20, turning the disk one subdivision gives a corresponding tool adjustment of 0.001 in.

In use, the steel block is clamped tightly in the turret toolpost, and the adjusting screw is run up against the end of the tool. Previously the tool is set slightly less than required and held lightly in the turret by setscrews. A wrench is then used to turn the adjusting screw, to move the cutting tool forward. Experience will show how much clamping pressure should be kept on the tool while being adjusted. The pressure should be enough to prevent slippage, but still allow the tool to be moved by the screw.



A tapered pin is used for locating a forging to be machined and left in place in the workpiece to prevent slippage, insuring more accurate parts

Processing of Sheet Stock Eliminates Marring of Parts

BY JOHN LOWRY
Northrop Aircraft, Inc. Hawthorne, Calif.

Aluminum and magnesium sheet stock, large quantities of which are used in this plant, was frequently damaged by marring and scratching during the various machining operations between its receipt and delivery of finished parts for inspection. Many of the defects were so serious that they could not be removed by ordinary burnishing and were therefore scrapped.

All aluminum and magnesium sheet stock is now processed with an oil coating as soon as received. This processing has eliminated practically all marring and scratching that occurred formerly and also many burnishing operations. Scrapping of parts has been practically eliminated.

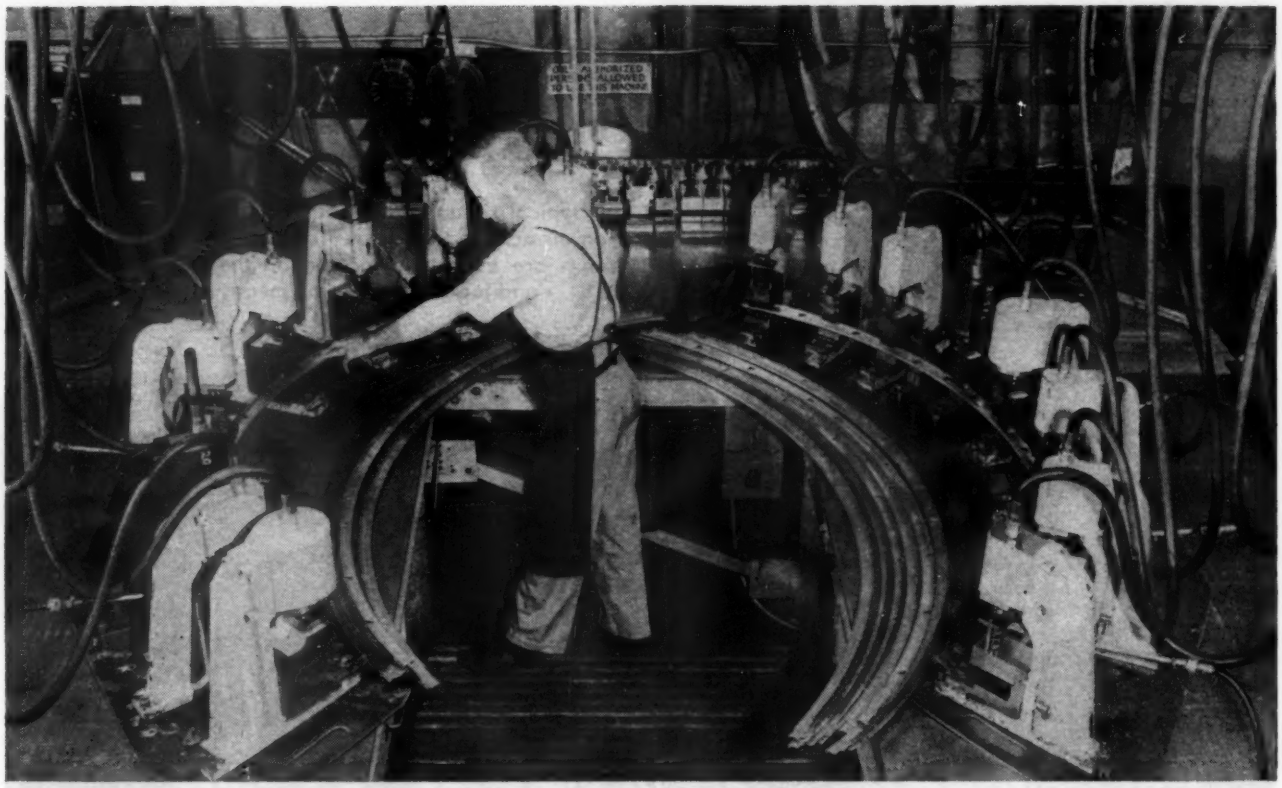
While the time saved by elimination of burnishing operations is difficult to estimate, it has been estimated as approximately 3500 manhours per year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Tapered Locating Pin Anchors Forgings

BY VIRGIL LAMBERT
Curtiss-Wright Corporation

When setting up forgings for machining, a tapered pin was used for locating the part, the pin being removed after chucking had been completed. It frequently happened, however, that the parts slipped during machining after removal of the pin. Clamps could not be drawn tight enough to prevent slippage, because of possible distortion of the parts.

In order to eliminate slippage, without causing distortion of the part, a new type of tapered plug was developed. This plug is used for locating the part and is left in place during the machining operation and prevents any slippage of the part and provides a more accurate center line for the finished product. The new plug is somewhat shorter than the type used previously. It makes chucking easier, but more fixed, saves considerable time and results in a better product. *War Winning Suggestion from the Board of Individual Awards, War Production Drive.*



The Boeing-designed hydropierce machine coordinates the rivet holes in circumferential segments with holes pierced in splice plates, clips and brackets which are riveted to the segments. The machine greatly speeds the assembly of fuselage sections

New Methods Reduce Handwork On Boeing Fortresses

BY C. W. EASTON

CHIEF PRELIMINARY TOOL ENGINEER, BOEING AIRCRAFT COMPANY

Welded construction, full-sized hole coordination and machine riveting help speed giant bombers on missions over enemy lines

AIRPLANE tool engineers are continually striving to reduce the hundreds of hours of hand tool operation that go into airframe assembly. Until recently, airframes were made as Indians made wicker baskets, the intricate framework of stringers and circumferentials that form the skeletons of wing and fuselage panels being tied together on assembly by drilling and riveting with portable tools.

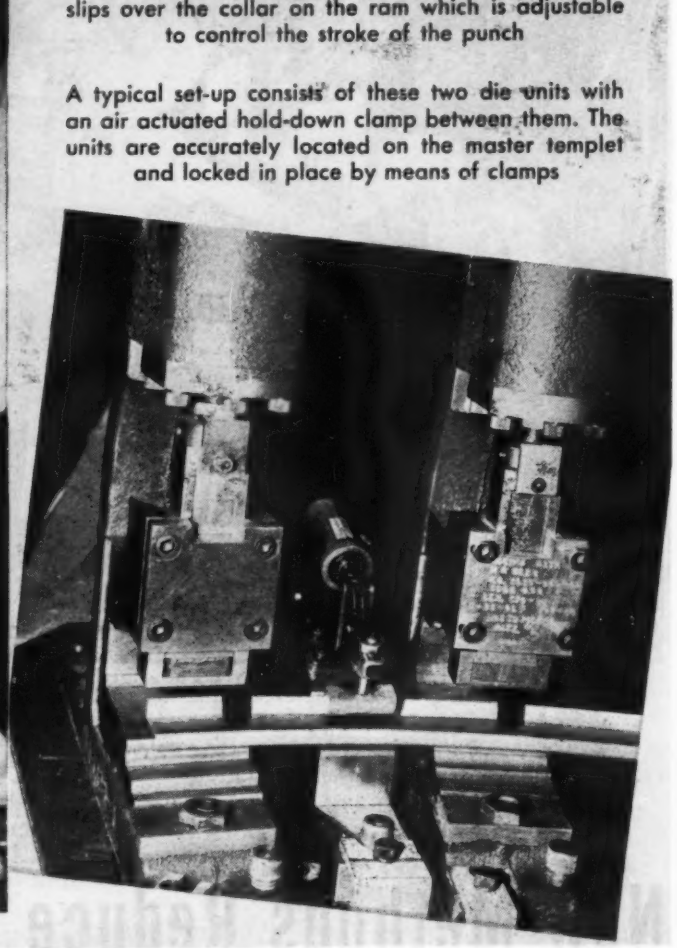
A basic approach to the problem has been to break down the design of major assemblies into conveniently handled manufacturing units which in turn has led to technical advances in resistance welding, machine riveting and full-sized hole coordination. All three of these methods are being applied at the Seattle plant of Boeing Aircraft Company to speed the building of heavy bombers.

In the case of welding, Boeing has developed automatic spot welding machines, capable of producing 90 accurately spaced spotwelds each minute. Machine riveting is quite familiar to aircraft manufacturers, with the Erco, General and Chicago riveting machines being good examples.

Full-sized hole coordination means the prepunching of parts, such as stringers, longerons, circumferentials and clips so that the mating holes will match at assembly without reaming or cleanup. It should not be confused with the use of undersized pilot holes in one or both mating members to be opened when

Diesets are easily installed in the hydropierce frames. The wedge block (lower left) is adjusted by a nut mounted on an eccentric. The small lip on the punch slips over the collar on the ram which is adjustable to control the stroke of the punch

A typical set-up consists of these two die units with an air actuated hold-down clamp between them. The units are accurately located on the master templet and locked in place by means of clamps



the parts are located in a jig for assembly.

Coordination has been achieved pretty generally on bolted connections where clearances up to 1/32 in. are permissible. The real difficulty lies in riveted joints where only a few thousandths of an inch tolerance are allowable if proper rivet "fill" is to be obtained.

The airframe is still a flimsy structure made of light materials and subject to variations of temperature and creep during fabrication. Manufacturing tolerances in rolling, extruding, forming and machining these materials may be cumulative in their effect when the parts are fitted together. Because of the fact that an airplane has virtually no two parallel lines, the job of tooling for hole coordination is intensified.

Consider for a moment the driving of a ⅛-in. rivet. A commercial manufacturing tolerance on this size is 0.123-0.1285 in. Boeing design, to insure rivet fill, calls for a 0.131 in. hole to accommodate this size of rivet.

As the rivet die wears, the rivet shank tends to become larger. In fact large runs of rivets with a diameter of 0.128 in. are common. Let us assume also that a manufacturing tolerance of ±0.005 in. is permitted on the center distances of punched holes in sheet-metal parts which is considered good pressed metal practice. Then two mating parts may have holes as much as 0.010 in off center wheras the clearance between rivet and hole is only 0.003 in. This condition does not include consideration of draft in the punched holes (which may be considerable in thicker sections) or other causes of variation. It explains the still wide use of portable tools in drilling and riveting at assembly, for in order to obtain full-sized hole coordination hole center limits must be more on the order of ±0.001 than ±0.005 in. This degree of precision puts sheet metal practice on the plane of fine machine work. Yet it is being done in some instances.

Hydropierce Spaces Accurately

A good example is the set-up developed by the Boeing Tooling Department for punching circumferentials for the rivet holes used for attaching clips. The clips themselves are small angle-shaped stampings which can be pierced in the punch press without difficulty. The problem is to locate and punch accurately the mating holes in the circumferentials. To do this a hydropierce set-up has been devised and put to use.

The machine has a flat semi-circular work table open at the center. Upon the table photographic templets of the workpieces are laid. The templets show the positions of all rivet holes and serve to locate the rivet hole piercing units by means of dowel pins.

Each piercing unit consists of two standard parts: a frame with a hydraulically actuated ram and a dieset in which punches and dies are mounted accurately before being put into the machine. The dieset is attached to the frame by a wedge block and a dowel pin which position it fore-and-aft and transversely respectively. The connection is so simple that a dieset may be removed and replaced in less than a minute. The removable unit makes the actual setting of punches and dies in the toolroom feasible. Thus greater precision can be expected than from set-ups made on the machine.

Each of the piercing units is operated by a hand valve. Hydraulic pressure is supplied from a cylinder supported on a framework above the work table. This cylinder in turn receives its pressure from a larger cylinder served by the plant compressed air system, thus avoiding the need for an extra source of power. Each hoseline is controlled by a separate valve from a semicircular oil line paralleling the work table. Twenty-four piercing units can be operated at one time each from its own pressure hose. The various hose lines extending from above in irregular loops give the machine a weird Medusa-like appearance (the girl with snakes for hair) that rivals the similarly constructed Boeing "Octupus" used for putting stringer-clearance holes in circumferentials.

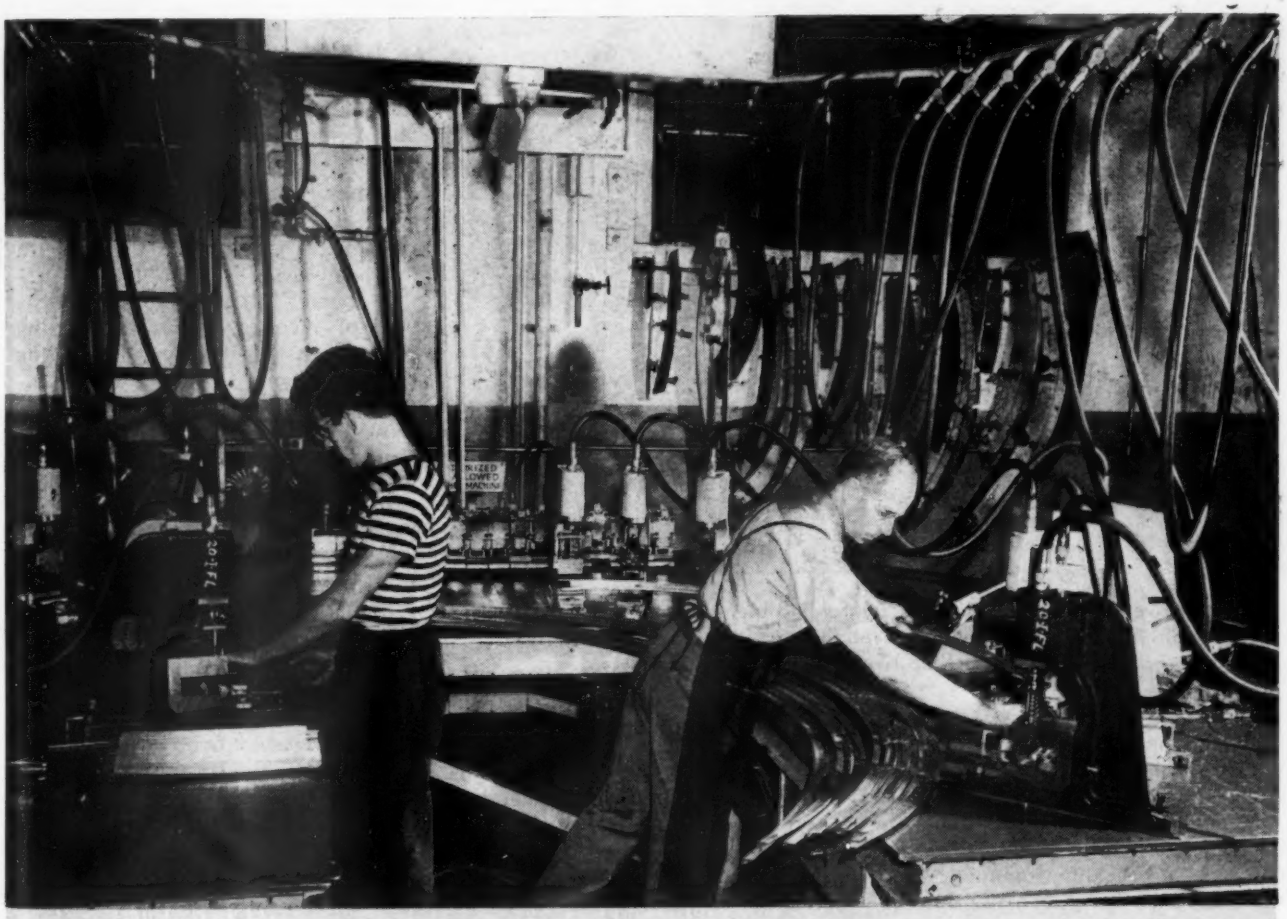
On Boeing's new airplane designs the clips which are thus hole coordinated for riveting to the circumferentials are also pierced for their connection to the stringers. Clips and circumferentials are joined on a bench as a subassembly operation. They are then placed in an assembly jig where the prepunched stringers are added to form the fuselage framework, just as parts are put together in a child's Meccano set.

Machine Riveting Employed

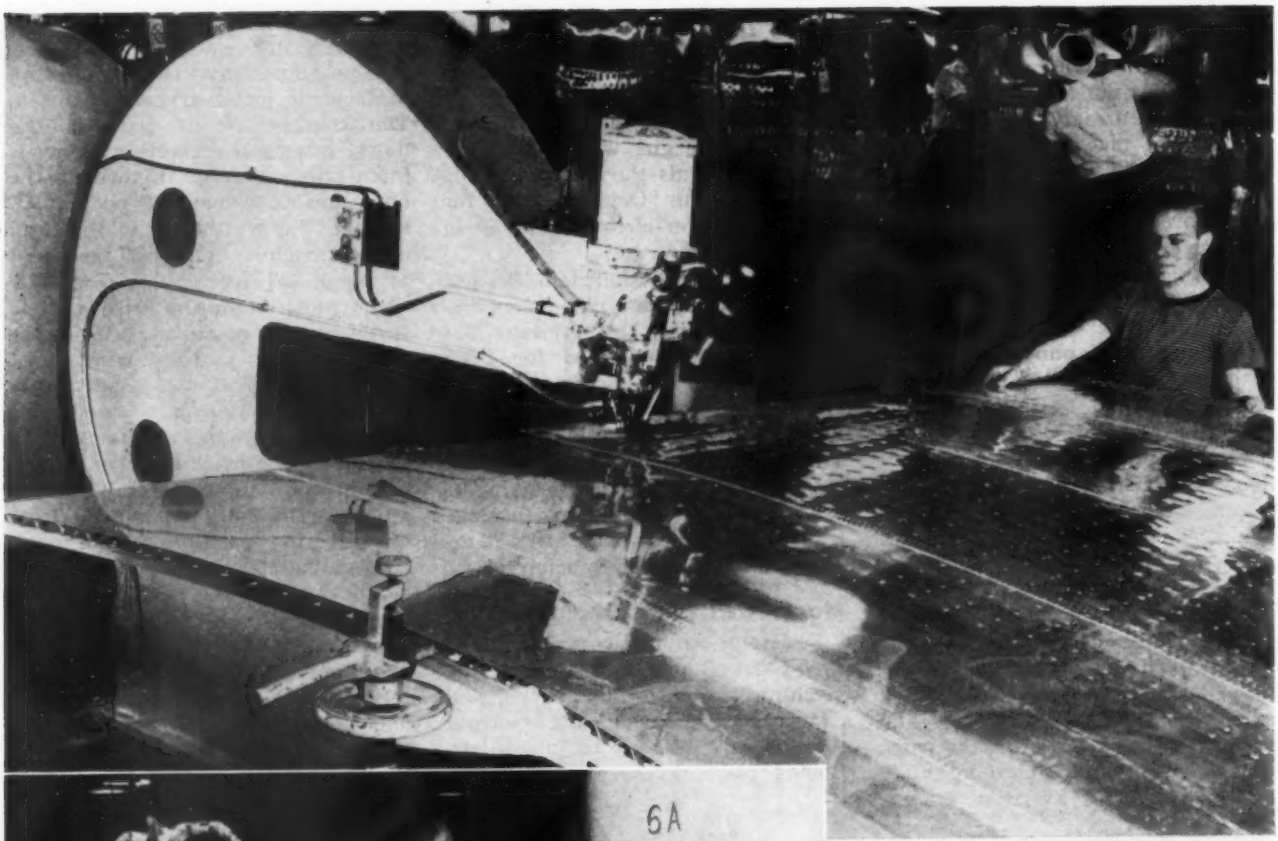
For semi-automatic riveting, the Erco C-frame punching and riveting machine, made by Engineering and Research Corporation, has been put to work on a variety of jobs in the Boeing plant. This equipment requires no drilling, reaming or countersinking in the workpiece. Hence, hole coordination is not required on parts being joined where it is used. The machine itself punches the holes, inserts the rivets and heads them pneumatically all through the operation of a pair of pedals. A beam of light attached to the head of the machine indicates the point at which the rivet will be located.

A typical job on the Erco machine is the riveting of smooth skin to corrugated sheets to form wing panel assemblies. The two sheets are clamped to roller floor stands adjusted by screw jacks to the correct height for the machine. Each stand has three rollers and may be moved along as the work is changed from one riveting position to the next. Approximately 40 rivets per minute can be inserted and headed on work of this kind.

It is evident that this semi-automatic operation is faster than drilling the holes, inserting the rivets and heading the rivets with portable tools. One estimate puts the Erco method at a fifth the cost of



This set-up shows the versatility of the hydropierce and the variety of shapes that can be prepunched at one time. The view shows also how hydraulic pressure is supplied to the units from a header. Each half of the unit operates indefinitely



An Erco riveting macine punches the sheet, inserts and heads the rivet, to assemble the corrugated sheet and the Alclad skin for a wing section

Gang riveting is employed on a reinforcing member of the wing spar through the use of a General riveting machine. Note the use of a "mouse" to back up rivets in the hollow section

the hand operation. An additional advantage is the uniformity of results.

Machine riveting is also done on equipment manufactured by the General Engineering Company. This machine does not punch the hole or insert the rivets, but does have the advantage of being able to head rivets in multiple. The machine has a bucking plate which can be adjusted for height and a hydraulically actuated upper ram. The number of rivets that may be handled at one time depends on the rivet size. For example, six ¼ in. diameter rivets may be headed simultaneously or fifteen 5/32 in. diameter rivets. The rivets may be in a single row or in several rows, so long as the proper tools are used with the machine. This method of riveting is particularly useful with flat-head rivets.

A special but interesting application of riveting is on the Flying Fortress fuselage section of the wing spar. This spar is a transverse reinforcing member that ties the two wings together. It is made of a hollow box cross-section of SAE 4130 steel heat-treated. The interesting feature of the set-up is that the rivets are headed from the inside. In this case, it is necessary to predrill spars and the webs which are attached to them, and insert the rivets ahead of this machine.

The workpiece is mounted on dollies which rest on tracks set on the floor. The dollies are used to bring the hollow spar over an expanding riveting head. Directly above the head is an inverted anvil which is adjusted for height by means of a hand-operated screw. The riveting head is pneumatically operated by means of a wedge which expands two flat surfaces against opposite walls of the spar, and flattens the heads of rivets extending through the upper wall. This machine han-

dles a row of rivets at one time. The pneumatic cylinder which actuates the riveting head is controlled by a pedal conveniently near the operating position.

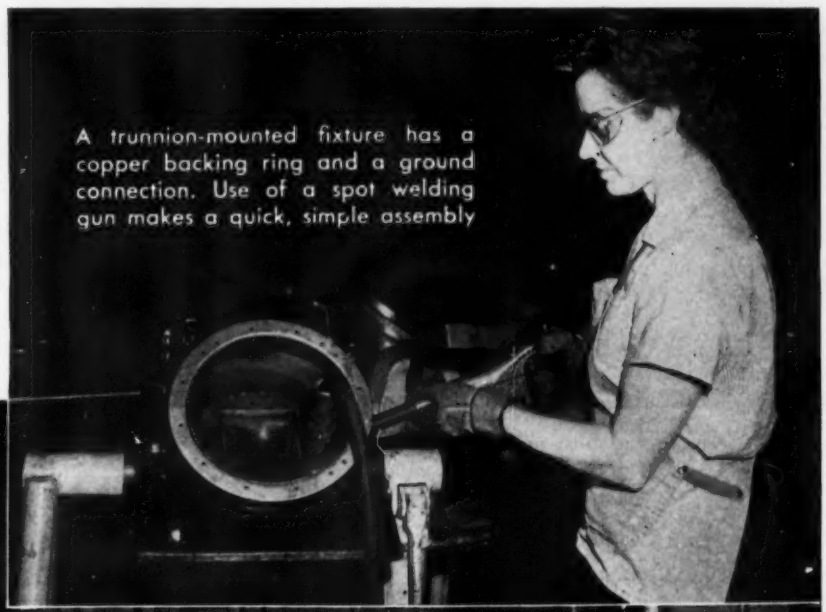
A handwheel is available to give transverse motion to the workpiece so that parallel rows of rivets may be headed in one pass of the workpiece. The air cylinder is provided with an automatic cut-off which may be regulated by a lever at the front of the cylinder stand. This is used to prevent overtravel of the piston for a particular size of spar on which it is used. Otherwise the wedge action might be carried too far and the riveting head broken.

Machine riveting depends on the use of small subassemblies which are being used to a great extent in the Boeing plant. Speed and uniformity result from these mechanical methods. The rivet is driven straight and with a continuous squeeze which avoids variations caused by work hardening due to repeated blows with portable tools.

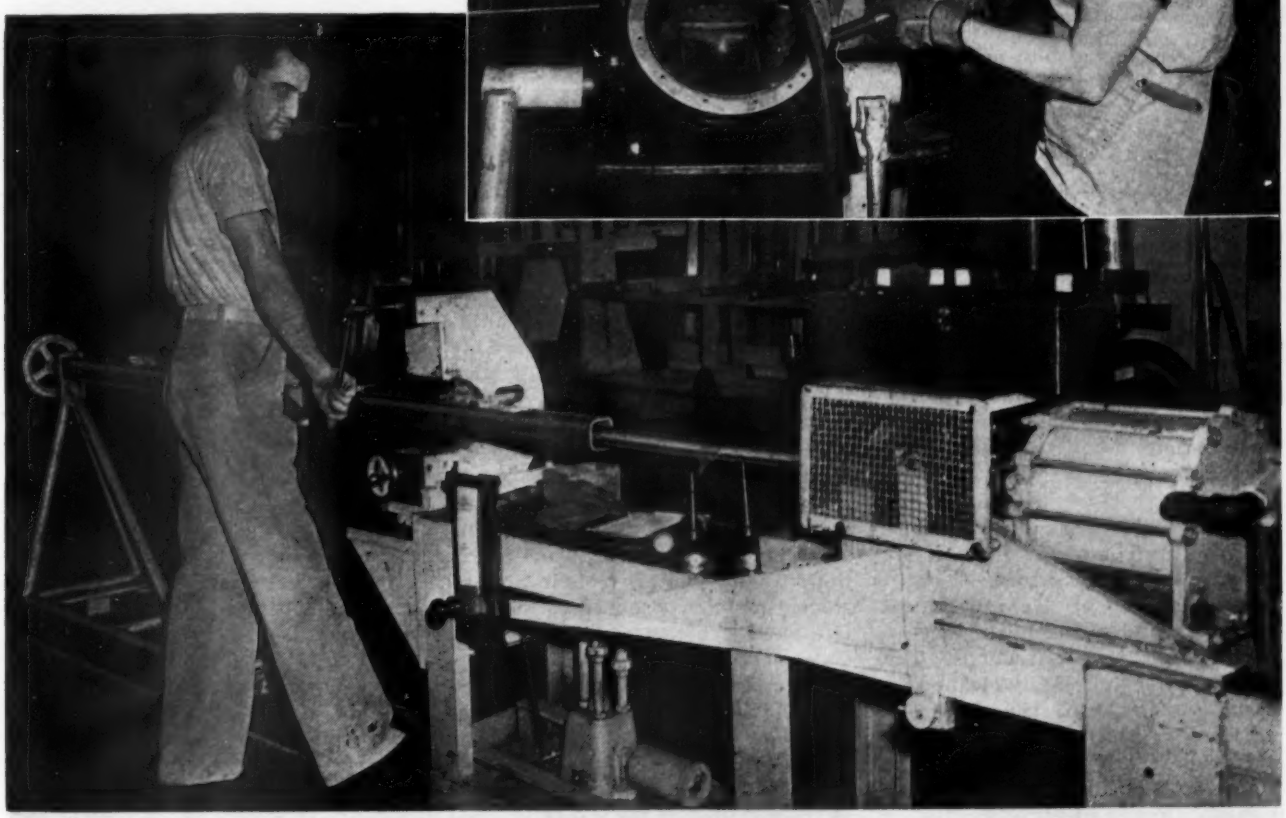
Welding Widely Applied

Welding has proved itself in aircraft construction and is daily finding new applications. There has never been any question of its reliability on steel subassemblies, but until the newer storage-type welding controls were developed, the process was limited on duralumin to unstressed members. There is no doubt that the need for safety in the air and the unwillingness to employ a process that had not proved itself in service worked against a more rapid acceptance of welded airframe construction. Today, however, there are many examples of its successful application, and many of these can be found on the Boeing Flying Fortress.

A typical case of use of welded fabrication on steel parts is found on the stainless steel shroud that covers the exhaust line. At one time this member was made in three parts: a flat flange, a circular collar and a cylindrical pipe section made by rolling a flat sheet. The flange was spotwelded to the collar and the subassembly riveted to the cylindrical section. Now only two parts are used, the flange and collar being made from a single piece of sheet steel, press drawn to shape. This part is spot welded to the cylindrical section by the gun method. The workpieces are held in a trunnion-mounted fixture that can be pivoted for the welder's convenience. An inner ring built into the fixture is made of copper and is connected to a copper post which forms the terminal to which the negative electrode is attached. The stainless steel collar is fitted around the copper ring; then the cylindrical part is placed



A trunnion-mounted fixture has a copper backing ring and a ground connection. Use of a spot welding gun makes a quick, simple assembly



This Boeing-designed gang riveting device uses an expanding "mouse" on the inside of the spar and a bucking yoke on the head of the rivet

Among the best methods for spot welding aluminum is this automatic machine which makes up to 90 accurately spaced welds a minute and is used to weld skin panels into a single sheet

around it and clamped by a steel outer ring that slides over the assembly.

Slots in the collar indicate where the spot welds are to be made. The welding is done with a Sciaky 40-kva. gun welder mounted on a radial arm. Since the negative terminal is already built into the fixture, all the operator has to do is press the gun against the workpiece to complete the weld. The parts are merely tack-welded in this fixture, since the work can be more conveniently completed in a standard spot-welding machine.

An example of welding dural sheets is found in the Boeing set-up for spot-welding skin sections. The skins are first thoroughly cleaned by washing in Oakite 63, rinsing, washing again in Oakite 84, rinsing again, and drying with an air blast. The edges to be welded are then buffed with stainless steel wire brushes.

Welding equipment consists of Taylor-Winfield Hi-Wave spot welders with refrigerated electrodes. Refrigerant is supplied to the electrodes at 10 F. Skin sections are held on tables made by welding together steel tubing and structural shapes with wood slatted stops.

The table tops are moved automatically past electrodes. They are mounted on tracks and are guided by hardened rollers on top, bottom and sides.

The motion of the table is supplied by two air cylinders. One cylinder furnishes a ratchet feed which indexes the table along. The second cylinder operates an indexing pin which enters slots in a rack-shaped member attached to the bottom of the table to position the spots accurately.

The table top may also be moved transversely to position the row of spots in relation to the skins. The most common type of joint has two double rows of spots. The transverse position of the table is fixed by dowel pins that enter a plate on the frame of the supporting base.

In operation, the welding and the table movement are centered in a single control, so that the skins are inched along automatically as the spots are formed. An average cycle of 40 spots a minute is maintained, although this can be varied to suit the thickness of the skins. The voltage and pressure on the electrodes may also be varied to suit the material. The pressure varies from 400 lb. on 24 ST Alclad 0.016-0.018 in. thick, to 1250 lb. for the same material, 0.040 in. thick.

Up to eight skins are welded together by this method. Because the combined skin sections greatly exceed the width of the table, a special reel has been devised to handle them. This consists of a roll around which the skin is coiled with an outer cylindrical support. As each new skin section is added, the previously welded sections are coiled around the roll until the entire job is completed. Then the roll is rocked out on hinges which attach it to the table top, and the coil of skins is tied with a cord and carried away.

AMERICAN MACHINIST REFERENCE BOOK SHEET

Simple Indexing of Any Angle—I

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

IN SIMPLE INDEXING, each time a division is made on the work surface, the index crank of the dividing head is moved through a certain number of holes on the selected hole circle of the index plate. Thus for a given division, the index crank moves a specific fractional turn. If the shop has a sufficient number of index plates and a table "Hole Circles for Decimal Turns of Index Crank," it is possible to divide a circle into any number of parts, odd or even, with negligible error. Thus war-plant personnel need not struggle with compound or differential indexing.

The "Hole Circles" table (on a following page) advances by increments of 0.0001 turn in the range of 0 to one revolution. For each 0.0001 turn, wherever possible, an entry is made for the hole circle D and the number of holes N to be traversed with the index crank in order to produce the fractional turn required. This table is worked out for the index plates A to F and Special supplied by the Cincinnati Milling and Grinding Machines, Inc.

Use of the table is as follows:

Problem 1: To select the index plate and hole circle that will index 52 min. 50 sec. Calculate the error of indexing.

Solution: Convert 52 min. 50 sec. to decimal degrees.

52 min. = 0.86667
50 sec. = 0.01389

0.88056

Since one turn of the standard 1:40 dividing head equals 9 deg., the fractional turn to index 52 min. 50 sec. equals 0.88056/9 = 0.09784. In the "Hole Circles" table, the nearest fractional turn with an entry is 0.0979, and $D = 143$; $N = 14$.

What is the angular error? Angular movement per division equals $14 \times 9/143 = 0.88112$ deg. Thus the error is 0.88112 — 0.88056 = 0.00056 deg., or 2 sec.

Problem 2: What is the linear error if 100 such divisions are laid off on a circle of 1 in. radius? One hundred divisions with the above 14/143 combination gives a total angular movement of 88.112 deg., or 88 deg. 6 min. 43 sec. On the other hand, 100 times 52 min. 50 sec. equals 88 deg. 3 min. 20 sec. Thus the error is + 3 min. 23 sec. or + 0.05639 deg. With the aid of an accompanying table, express the angular error in radians, as follows:

0.05 deg. = 0.000873 rad.
0.00639 deg. = 0.000112 rad.
0.05639 deg. = 0.000985 rad.

Thus

The total linear error for 100 divisions at a 1-in. radius is thus equal to $0.0010 \times 1 = 0.0010$ in., for practical purposes.

Index Plates for Cincinnati Dividing Head

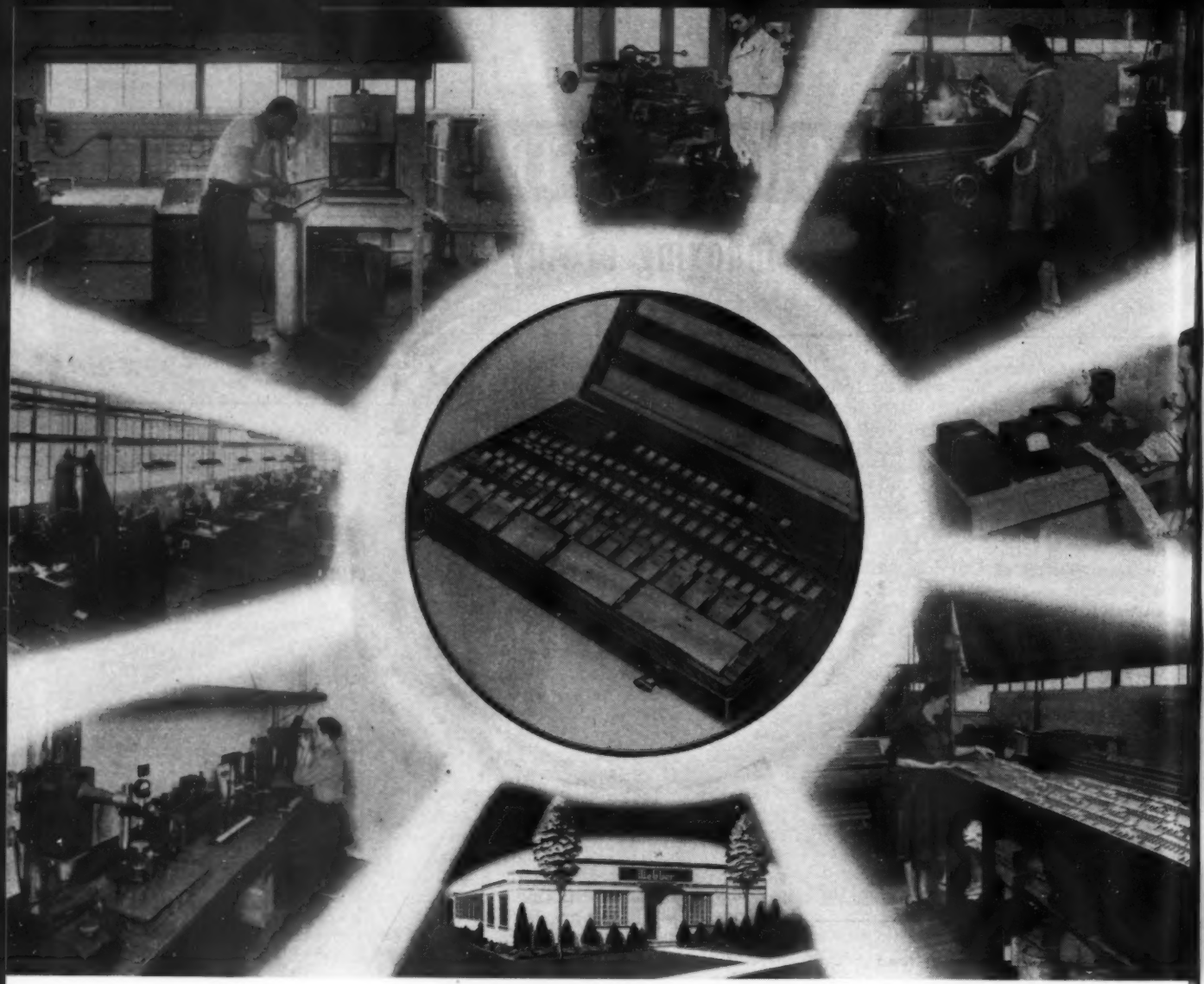
A	B	C	D	E	F	SPEC.
189	199	197	193	191	187	201
177	183	181	179	175	173	200
171	169	167	163	161	159	180
147	157	153	151	149	143	144
129	141	139	137	133	131	108
117	127	123	121	119	113	
99	111	109	107	103	101	
91	97	93	89	87	83	
69	81	79	77	73	71	
		46	44	42	38	
		34	32	26	28	

Degrees to Radians

Deg.	Radians	Deg.	Radians	Deg.	Radians	Deg.	Radians	Deg.	Radians
10	0.174533	1	0.017453	0.1	0.001745	0.01	0.000175	0.001	0.000017
20	0.349066	2	0.034907	0.2	0.003491	0.02	0.000349	0.002	0.000035
30	0.523599	3	0.05360	0.3	0.005236	0.03	0.000524	0.003	0.000052
40	0.698132	4	0.069813	0.4	0.006981	0.04	0.000698	0.004	0.000070
50	0.872665	5	0.087267	0.5	0.008727	0.05	0.000873	0.005	0.000087
60	1.047198	6	0.104720	0.6	0.010472	0.06	0.001047	0.006	0.000105
70	1.221731	7	0.122173	0.7	0.012217	0.07	0.001222	0.007	0.000122
80	1.396264	8	0.139626	0.8	0.013963	0.08	0.001396	0.008	0.000140
90	1.590797	9	0.157080	0.9	0.015708	0.09	0.001571	0.009	0.000157

Minutes and Seconds to Decimal Parts of a Degree

Min.	Degrees	Sec.	Degrees
0	0.00000	0	0.00000
1	0.01667	1	0.00028
2	0.03333	2	0.00056
3	0.05	3	0.00083
4	0.06667	4	0.00111
5	0.08333	5	0.00139
6	0.10	6	0.00167
7	0.11667	7	0.00194
8	0.13333	8	0.00222
9	0.15	9	0.0025
10	0.16667	10	0.00278
11	0.18333	11	0.00306
12	0.20	12	0.00333
13	0.21667	13	0.00361
14	0.23333	14	0.00389
15	0.25	15	0.00417
16	0.26667	16	0.00444
17	0.28333	17	0.00472
18	0.30	18	0.005
19	0.31667	19	0.00528
20	0.33333	20	0.00556
21	0.35	21	0.00583
22	0.36667	22	0.00611
23	0.38333	23	0.00639
24	0.40	24	0.00667
25	0.41667	25	0.00694
26	0.43333	26	0.00722
27	0.45	27	0.0075
28	0.46667	28	0.00778
29	0.48333	29	0.00806
30	0.50	30	0.00833
31	0.51667	31	0.00861
32	0.53333	32	0.00889
33	0.55	33	0.00917
34	0.56667	34	0.00914
35	0.58333	35	0.00972
36	0.60	36	0.01
37	0.61667	37	0.01028
38	0.63333	38	0.01056
39	0.65	39	0.01083
40	0.66667	40	0.01111
41	0.68333	41	0.01139
42	0.70	42	0.01167
43	0.71667	43	0.01194
44	0.73333	44	0.01222
45	0.75	45	0.0125
46	0.76667	46	0.01278
47	0.78333	47	0.01306
48	0.80	48	0.01333
49	0.81667	49	0.01361
50	0.83333	50	0.01389
51	0.85	51	0.01417
52	0.86667	52	0.01444
53	0.88333	53	0.01472
54	0.90	54	0.015
55	0.91667	55	0.01528
56	0.93333	56	0.01556
57	0.95	57	0.01583
58	0.96667	58	0.01611
59	0.98333	59	0.01639



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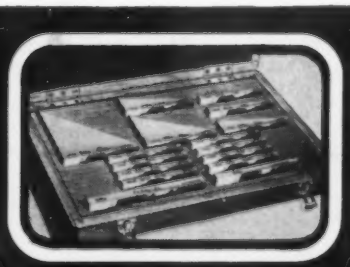

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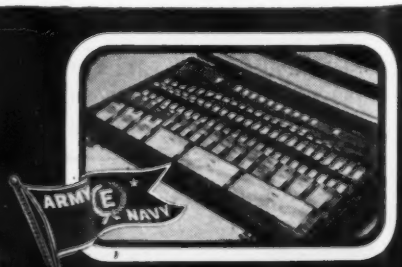

AMERICAN MACHINIST REFERENCE BOOK SHEET

Simple Indexing of Any Angle—II

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

HOLE CIRCLES FOR DECIMAL TURNS OF INDEX CRANK

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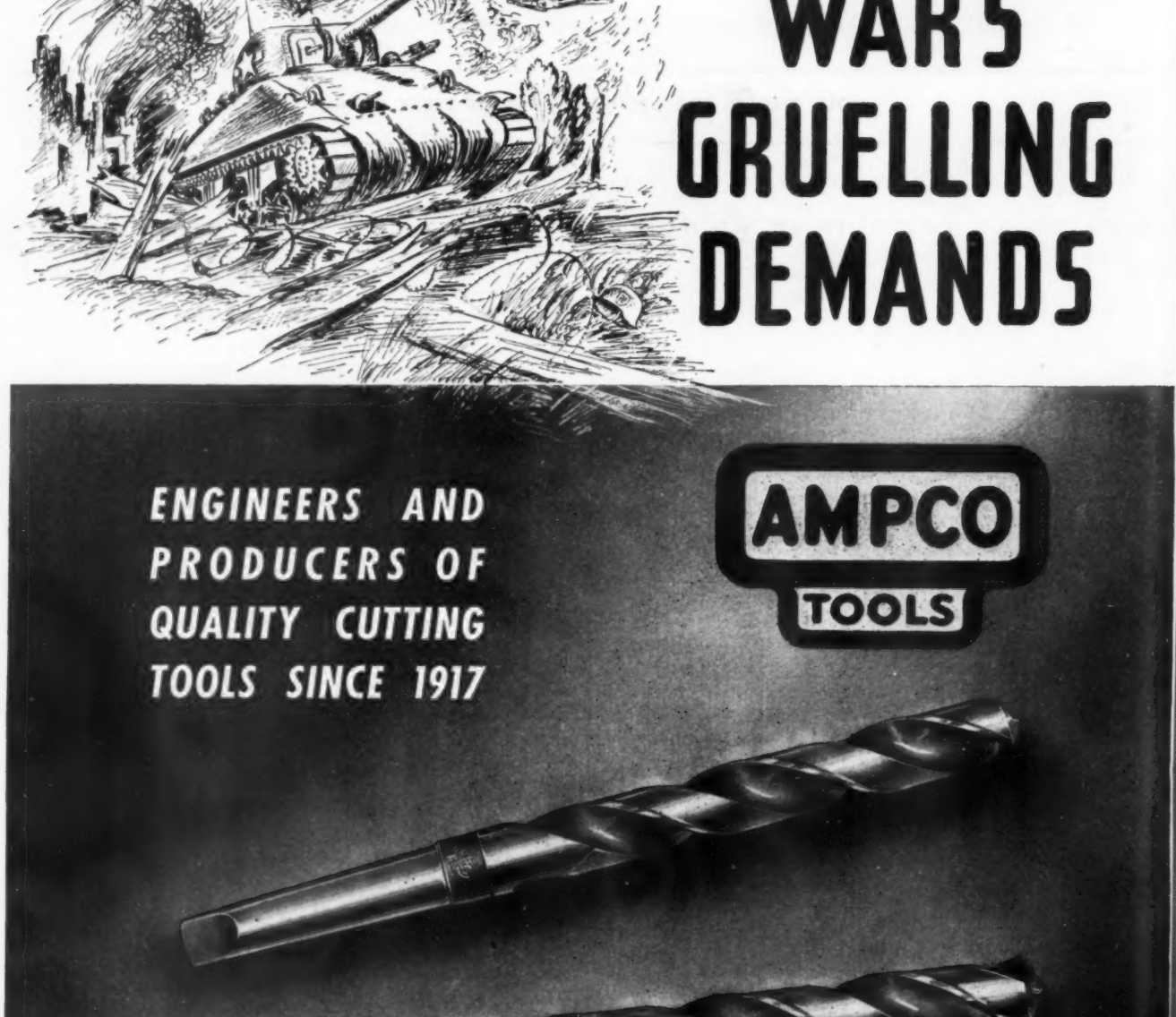
(This table will be continued in an early issue)

MEETING WAR'S GRUELLING DEMANDS



AMPCO TWIST DRILL CO.
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Gaging Business

Tool Backlog Soaring

Machine tool builders are having the biggest war load dumped on them since the "tooling-up" days early in the war production program. The new emergency requirements, particularly for artillery shell and other ground force equipment, brought a further rise in new orders in December to $65,009,000 (as against $62,272,000 in November) and made the industry's backlog soar to $260,501,000 (from $235,396,000 at the end of November). This is a substantial recovery from the March 1944 low of $147,000,000.

The current backlog does not include some $40,000,000 of pool orders distributed sparingly among a relatively small number of tool builders to give them the production "green light" in advance of formal orders from war contractors. The bulk of the pool orders were placed in December, although some were also distributed early in January. Moreover, further pool orders are promised by Washington, but the exact quantities depend upon the clarification of military requirements which are still very unsettled. In any event, urgent military orders are being given preference over all other business.

Shipments Still Low

Despite the uninterrupted rise in the industry's new business and unfilled orders, tool builders have been unable to lift shipments closer to incoming orders. At $36,782,000 for December, shipments were only slightly higher than the November total of $36,277,000. Even cancellations were too low to relieve the situation at $2,904,000 for December, as against $3,566,000 for November.

The inability of the industry to lift shipments stems from two causes: (1) a continuing lack of manpower; and (2) military pressure for the industry's production of direct war items, such as shells, supercharger parts, and so on. One leading tool builder with 3,500 workers at his plant needs 350 men, another requires 900 more workers to handle the increased tool load. Without this labor, shipments cannot be increased. Moreover, the possibility of diverting some employees on direct war work to tool building is remote in view of military pressure for both the war items and the machine tools being turned out by the industry. To make matters worse, the Army is trying to place more direct war orders in tool plants.

This situation spells continued deferral of the Russian and unrated orders now on the industry's books for a total of $100,000,000 worth of business. However, a small amount of this work which was in process months ago is being turned out. In December, tool builders shipped $3,003,000 in unrated orders and $3,900,000 in Russian business.

More Business Looms

The industry may be deluged with another batch of orders. It is reported that many of the tools in small arms plants will have to be replaced because of the intensity with which they were used during the past three years. Moreover, some of these tools have been taken out of small arms plants and installed in other war factories, and are thus not available for the currently stepped up small arms program.

The 1945 small arms requirements are set at 9,726,000,000 rounds. This compares with the peak monthly output of 1,791,000,000 rounds achieved in July 1943, which was gradually cut to 397,000,000 in July 1944. The difference between those figures indicates the level to which small arms ammunition must be stepped up. To lift output, 46,000 workers are needed.

Used Tools May Help

The pressure on the tool industry might be relieved if all the idle tools owned by the government were taken out of various plants and put into the ammunition factories. As a result the Lloyd Machine Tool Panels have been revived to aid the Ordnance Department uncover idle machines. These panels are composed of experienced tool distributors, familiar with the situation in their own districts. Working through the Ordnance Department's thirteen districts, the Panels may turn up as many as 40,000 machines, with the aid of the services and the Defense Plant Corporation. Recently in one plant formerly making trainer planes some 1700 machine tools were found which could be reassigned elsewhere, because that plant was converting to tire production and would not need the tools.

Recently, the Army told Detroit plants that 4,000 machine tools would have to be lined up for the ammunition program, but the Army didn't specify which tools were actually needed. When pressed for details, the Army finally listed 500 tools as required. Over 100 of these were in Detroit plants, government-owned but not declared surplus. Before declaring these surplus, the Army will have to check to make sure that these tools will not be needed where they are for the next 60 days.

Spot Authorizations Dropping

Manpower shortages, the general tightening of most types of non-ferrous metals, and unavailability of steel, have practically nullified spot authorizations which had been granted in recent months. Many plants were awaiting decisions from the OPA on pricing of civilian items before trying to produce them. However, the increased munitions program has all but wiped out the number of plants operating under spot authorizations. Many of them have voluntarily sought and received new munitions orders and are back at war work. At the same time, labor working in non-essential industries has already responded to the Byrnes' "work-or-fight" order, thus serving to further return the nation to its all-out war effort.

The increased aluminum requirements and reduced production is cutting the large stockpile of the metal. Recently at 500,000,000 pounds, this reserve is expected to be cut in half by mid-1945. Panic-buying of aluminum sheet has already jammed up mills with 270,000,000 pounds of orders.

Luxemburg Steel Plant—This Bessemer converter in Luxemburg is supplying some of the steel requirements of the U. S. Engineers Corps. Other plants in Belgium and France are also supplying items for U. S. military requirements, thus helping to relieve the greater pressure on American war plants

Service Act Pressure Increases, As Manpower Muddle Grows

President, Byrnes, Army and Navy reported as only supporters of National Service Act. Confused armament requirements upset manpower need estimates, now at 148,000. Many hold to belief that easier solutions are available, that Act would fail

WASHINGTON—Although a new Army Supply Program has been prepared since the recent German break-through, continual changes and lack of more definite estimates of munition requirements have served to utterly confuse the manpower situation. Since the Army and Navy are the strongest supporters of the National Service Act, there is some growing belief that more definite manpower and munitions figures will not be available until after such legislation has been acted upon by Congress, either favorably or unfavorably.

It is rumored that the War Manpower Commission opposes a National Service Act, since it realizes that many of the workers needed in tire plants, machine tool plants, and similar industrial operations would have to be skilled men, and that such men cannot be diverted from less essential industries where no such skills are required. The War Manpower Commission has found the labor problem to be one of fluctuating shifts in urgency and excess from plant to plant, and area to area. One time it is the copper mines or the airplane plants, then the tire plants and foundries run into trouble, and so on. However, many of the needed men were found to be in the armed services all too often.

Draft Hurts Production

Right now, the Army is planning to draft some 225,000 men in the 26-29 age bracket out of both essential and non-essential industries. If the military goes through with this plan, it is estimated that output of some items may be reduced by as much as 15%. Moreover, these men will not be replacable by a National Service Act, because workers with their skills are unavailable in the ranks of non-essential industries for the most part. Just how the military can justify this action to themselves is regarded as almost impossible to understand, when it is now releasing some 10,000 soldiers to work in critical industries, bringing the total of such releases since December 15th last to 16,500. The upshot of the 26-29 draft is expected to be that further numbers of soldiers will be released from the Army to take their places.

Murray Statement Lucid

Perhaps the soundest criticism to the National Service Act was that of Philip Murray, President of the CIO, in testifying before the House Military Affairs Committee. Mr. Murray stated that "the magnitude of the job is far more manageable than Cnogress and the public had been led to believe," and that "the problem is a series of local problems" which can only be licked locally. Mr. Murray proposed that a conference be held between government leaders, industry, labor, and agriculture to establish: (1) the plants and areas where production is short; (2) whether there is maximum utilization of manpower, materials, and management in those plants; (3) the ending of as much unnecessary use of manpower and materials in luxury items; (4) the payment of the transportation and protection of seniority of workers transferred from one area to another; (5) whether low wages are effecting any production lags; (6) better utilization of manpower; (7) coordination of procurement policies to avoid confusion and contradiction in production requirements.

Opposition to National Service by both the CIO and AFL is expected to reduce some of the Administration's pressure for this legislation in the weaning away of some congressional supporters. Considerable opposition has developed from the spreading belief that many more effective measures could be taken to improve the manpower situation without going into the complicated process of National Service.

Observers point out that labor "hoarding" is still going on at many cost-plus-fixed-fee operations, that make-work rules of unions are maintained in the most critical labor areas, that labor utilization is not what it should be in many Navy yards and armament plants, that procurement policies of government agencies could be improved in many ways, and that the draft continues to cut into the declining supply of skilled labor. Since the shortage of 148,000 workers in various plants are purely local developments, manpower experts contend that solutions are likely if the problems were attacked plant by plant.

LABOR FORCE REDUCED AT CANADIAN MACHINE PLANT

VANCOUVER, B. C.—Gradual scaling down of night shift workers has been in progress at the plants of the Victoria Machinery Depot at Victoria, B. C. Such reductions over the last six months, as a result of relaxed pressure for vessel production, has cut the night shift to around 175, as against 1,000 workers in early 1944.

Employment on all shifts totals below 2,000, as against the peak total of 2,800 some months ago. It is reported that the firm will gradually get down to a straight day shift basis.

LLOYD RESUMES TOOL HUNT WITH NEW ORDNANCE PANELS

PHILADELPHIA—To aid the Office of the Chief of Ordnance of the War Department to find existing idle machines that can be put to work on new shell production programs, the Machine Tool Panels manned by experienced machine tool distributors have again become active. Panels are operating in each of the Ordnance districts under the general supervision of N. P. Lloyd, well-known Philadelphia distributor. His headquarters are at Room 401—1420 Walnut Street, Philadelphia. Any manufacturer having or knowing of equipment that can be used right away on shell manufacture is asked to communicate with his Ordnance district office or with Mr. Lloyd's office.

Coast 4-Fs Rush For War Work After Work-or-Fight Order

SAN DIEGO—The labor supply for war plants in this area has been increased materially by the Byrnes "work-or-fight" order. Local aircraft factories report that a substantial part of applications now being received are those of local residents heretofore classed as 4F. Moreover, separations have dropped sharply for the same reason, and fear of more drastic steps.

Furthermore, it appears that the need for new workers would not diminish appreciably in this area. Consolidated Vultee's local plant, recently switching to new models and retooling, will probably be needing more labor before long. Ryan Aeronautical Company, recently awarded a large new Navy contract, has several new buildings under construction. Other important aircraft subcontractors have large backlogs, much of which is B-29 work.

Inside Detroit

Manpower Confusion Grows

Millions of dollars in new war contracts are waiting for Detroit plants if something is done quickly about a confused manpower situation. The confusion is more manufactured than actual. The real state of affairs is known to industry, labor and the government agencies.

But what confuses it are the happenings in Washington. With the unemployment compensation applications rising weekly, thousands laid off and the list of critical shortages shrinking to under 3,000 in this area, Detroit is still classified as a No. 1 critical manpower area.

The labor advisory committee of the War Manpower Commission here has been cognizant of this situation for some time. Actually, a recommendation has been made that Detroit be changed from No. 1 to a No. 2 area. But so far, there has been no official action.

Behind this is the fact that just when something was about to be done, talk started about a labor draft and war jobs for 4-F's or else. It was felt that this would be a bad time to change Detroit's labor classification if so much hullabaloo was being made about lack of manpower.

Situation Not Critical

Meanwhile, the services were sticking by their caution against bringing new contracts into Detroit as long as it was a No. 1 area. Labor itself has been yelling since last November that Detroit could use more work, that thousands were being laid off and that peak employment had dropped by 24 per cent. It pointed out that Willow Run had gone from 40,000 to 20,000 and cutbacks and terminations had cut General Motors, Chrysler and Ford pay rolls sharply, as well as those of the independent auto makers.

Walter P. Reuther issued a statement last week (Jan. 18) that both the Army Service Forces and the Army Air Forces were ready to ease their ban on bringing new work here. Neither branch's representatives here would affirm this.

Strike Record Bad

Another factor that has not only kept new contracts out of Detroit but has taken some away is the area's strike record in 1944. At least one Air Forces contract was jerked out of the area because of a series of disastrous strikes last summer placed the firm behind schedule by 13.7 per cent.

This action on the part of the AAF just came to light with the release of a chart which plotted the course of production in this plant through four months when strikes were prevalent and the effects felt for some time afterward. The plant employed 22,000 workers and lost 215,000 man hours.

The strike record, however, appears to be improving. December showed a sharp drop from November, according to the report of the state labor mediation department. The state reported 41 tieups involving 22,672 workers against 73 the month before involving 77,798.

Jet Automobiles

Manufacture of the engine for the robot bomb has given Ray Rausch, superintendent of the Ford plants, the idea that the principle of jet propulsion might be applied to a new type of automobile engine. He revealed that the company is working on such an idea and he envisioned post-war possibilities of a rear-engine car employing this.

The simplicity of jet propulsion is what appeals most to Rausch, together with the vast possibilities of greater horsepower turnout with more economy. He pointed out that auto manufacturers now shoot for a weight of five pounds per horsepower in their engines.

But the jet engine can give three horsepower per pound of weight, Rausch said. The noisiness and other drawbacks of the jet engine can be conquered, he believes.

CANCELLED MEETINGS

In view of the Byrnes order, the following meetings have been cancelled:

American Foundrymen's Association, 1945 War Production Congress, Detroit, Michigan. April 30-May 4.

American Iron & Steel Institute. General Meeting. New York, N. Y. May.

American Society of Tool Engineers. Industrial Production Planning Exposition. Cleveland Auditorium, Cleveland, Ohio. March.

National Metal Trades Association. Annual Convention. New York, N. Y. Feb. 26-28.

May Schedule Taxis

Taxicabs may be the nearest thing to ordinary passenger cars to be manufactured in Detroit plants before the end of the war. George T. Christopher, president of Packard, revealed plans being studied by the War Production Board that may send some of the companies to making taxis soon.

Cabs for public transportation are thus put on the same category as municipal buses. Both have a better chance of getting WPB approval ahead of V-E Day than passenger cars, according to Packard. Figures submitted to Washington show that the taxi companies are paying as much for upkeep of their present equipment as the cabs cost them new. The same manpower being used to keep them running could just as well be used to building new fleets, the WPB has been told.

France-Bound Tank Destroyer—This M-18 "Hellcat" Tank Destroyer rolling off the assembly lines of the Buick Division of General Motors at Flint, Michigan, is bound for action on the Western Front. Weighing 18 tons, and mounting a 76-mm high velocity gun and a .50 calibre machine gun, the M-18 takes a crew of 5, has a speed of 55 miles an hour

British Surplus Tool Plan Like U. S. Program, But Non-Political

LONDON — Although unpublicized, British plans for disposal of surplus machine tools and other equipment after the war have taken definite form. They differ from the American program in that they seem to be divorced from political set-ups and will be carried out by Machine Tool Control, which throughout the war has controlled machine tools and allied items in their production, utilization, and pricing.

Protect Tool Market

MTC, as Machine Tool Control is known, is realistically considering the disposal problem with an eye to maintaining a strong machine tool building industry in Britain after the war especially for national defense purposes. These general principles have been agreed on: (1) disposal must be orderly; (2) speculators must be excluded; (3) machine tool market must not be injured or destroyed by disposal; (4) completely scrap older machines whenever possible; (5) to use newer machines to modernize British industries.

Pricing Flexible

Under present plans, pricing of surplus machines will differ from the U. S. inflexible sliding scale based on discounts from the original price for each year of service. MTC will impose a maximum and a minimum price, but its officials will have the right to sell machines at the most desirable intermediate level, depending on the condition of the equipment. Use rather than age will be the determining price factor. MTC is already assembling a staff from the British tool industry to start the big job of appraising government-owned machines. An estimate of the number of machines involved places the total between 200,000 and 250,000 units (the number of U. S. tools owned by our government is put at 600,000).

Small Tool Plan

A similar plan to that adopted in the United States has been devised for handling surplus small tools in Britain. The British government will sell back to the original manufacturers the surplus tools at a predetermined discount and the manufacturers then will feed out the used tools at a specified rate (still indefinite) to the new tools bought. Its difference from U. S. procedure is its provision for the acquisition of surplus tools held by private manufacturers as well as by the government, thus covering the entire disposal problem. U. S. tools would be sold back to the original British distributor to be parceled out in ratio to new tool sales. The matter of storage space for surplus machines is currently being discussed.

British Optimistic

British tool and equipment makers are as concerned over surpluses as are U. S. manufacturers. But some British industrialists hold that surpluses will not be a very wet blanket over the market for new machines, because the demand for the latter at home and abroad will be so great. Some British auto makers are anxious to secure some of the high-production American lend-lease equipment which can be converted to their uses after the war.

Fontana Shells—The forgings shown here are checked prior to shipment to the Kaiser ordnance unit at Denver for finishing into heavy shells. About 50 percent of Fontana's steel, or 700 tons daily will be used in the 8-in. and 155 mm. shell program of Fontana-Denver ordnance operations by March

Concerns Surrender Spots To Take on War Orders

CLEVELAND — Spot authorizations for civilian goods manufacture, granted in the midst of the recent reconversion enthusiasm, are being voluntarily relinquished by concerns in this area.

The Mansfield, Ohio, plants of the Westinghouse Electric & Manufacturing Co., has returned to full-capacity production of munitions after making about half of a quota of 157,000 electric irons granted under a War Production Board authorization.

The Perfection Steel Body Co., of Galion, Ohio, given permission to return to production of farm wagons, cancelled these plans and turned its facilities to the output of cargo dump bodies for prime mover trucks needed by the military.

George A. Moore, district manager of WPB, said WPB had not sought to pressure any manufacturers granted spot authorizations, by withdrawing materials or otherwise. He said the action of the two companies cited was an illustration of the laudable general reversal of the trend toward reconversion which was gathering headway last fall.

WPB is now surveying all plants which were granted spot authorizations to ascertain the extent to which these plans have been canceled as an index to current war production capacity.

Cleveland Power Strike Cost Million Man-hours of War Work

CLEVELAND—The metal-working industries bore the brunt of a brief but disastrous strike of electric utility workers here. Army officers called the walkout the most damaging yet to the war effort, costing an estimated million of man-hours of production.

Some 40 local plants were forced to reduce power consumption 50 to 75% during the 20 hours that elapsed before the Army moved in.

Climaxing prolonged threats of a strike over the refusal of the War Labor Board to approve wage increases of 7 cents an hour, the unionists left their posts the morning of Jan. 12 at the call of a union steward who had been denied work on a day shift.

Victor Stemberger, the union steward who precipitated the strike, was reclassified 1-A by his draft board, his occupational deferment cancelled. State Representative Jack Easton (R) introduced a bill into the Ohio Legislature to outlaw strikes by public utility employees for the duration of the war.

Wartime Washington

Labor Picture Confused

Although a new Army Supply Program has been prepared since the recent German break-through, it is already in process of being changed. This means that firm requirement for most munitions items are still lacking. New changes are impending in the tank program, the ammunition program, the airplane schedule, in signal equipment, and in many other items.

As a result of this situation, reliable manpower estimates for labor needs of war plants cannot be made.

Despite this situation, the War Production Board and the War Manpower Commission are forced to back up manpower need estimates, promulgated by the Army and Navy, and to go along with the generally serious tone of inspired manpower reports.

Krug Tried Hard

WPB's Chairman, "Cap" Krug, fought hard against the new "scarcity" crisis. He demonstrated that labor shortages only accounted for 22 percent of the lag in war production. Then he took a flying trip to bottlenecked plants in leading centers to help break production handicaps.

But his efforts were of no avail. The Army and Navy had been trying to promote a National Service Act for a long time. But they had little chance until the German break-through, which badly shocked the nation. Taking strength from this set-back, the military is reported to have "sold" the Service Act idea to Byrnes, who sold it to the President.

Government manpower experts say that even a National Service Act will not yield the skilled men needed at many war plants. This means that even such a law would fail to yield enough manpower of the right kind to eliminate the 1.5 percent lag in war production due to manpower shortages.

Labor Opposes Service Act

Both the CIO and AFL bitterly oppose the National Service Act with clear and logical reasoning. Other labor leaders hold it to be ironic injustice to transport workers hundreds of miles to work in a plant where better utilization of existing help would have eliminated the manpower shortage.

Opponents to the National Service Act point to the many holes now existing in the manpower dike, charging that even such a law would not curb these losses to the nation's labor forces: (1) absenteeism, averaging around 6 percent; (2) labor-hoarding, said to be as disgraceful as ever; (3) make-work union regulations, requiring stand-bys, work limitations, and other labor-wasting practices; (4) the labor quit rate, now at 6 per 100 workers, as against a pre-war rate of 2; (5) continued employment of labor in non-essential industries; (6) poor utilization of available labor due to poor union or management policies.

The elimination of any of these individual wastes of manpower would immediately wipe out the current shortage of 148,000 workers. But, labor fears that a Service Law also holds the threat of curbing strikes, upsetting maintenance-of-membership, the closed shop, union jurisdiction.

Maverick On Europe

At a press conference held shortly after his return from the battle-fronts, Maury Maverick, Chairman, Smaller War Plants Corporation, told of the tragedy of France. Lack of coal, he said, not only caused untold suffering from the bad weather, but tied up the railroads and prevented the rehabilitation of French industries. He contrasted the idleness of French steel mills with the present operation of plants in Belgium and Luxemburg. One Belgian plant was reported to be making 113 different items for the American Army.

Mr. Maverick contended that some way must be found for us to ship raw materials to France and Belgium to help rehabilitate those nations. He said that lack of raw materials prevents the operation of European steel, rubber, and textile plants.

Jones "Talks Back"

After much gossip about Wallace taking over Jesse Jones' various jobs, Jones finally revealed correspondence between the President and himself disclosing how Jones was fired. The President highly praised the work that Jones had done as head of the Department of Commerce and the Reconstruction Finance Corporation, but wrote that he was terminating these "splendid services" to reward Henry Wallace for his hard work during the recent Presidential campaign.

In reply to this letter, Jesse Jones stated that he could not agree with the President that Henry Wallace was "fully suited" for the job. He pointed out that Wallace lacked experience in business and finance, which he held to be essential to holding these jobs. Jones stated that he could not "reconcile these encomiums with your avowed purpose to replace me." In addition, he turned down the President's offer of an ambassadorial post.

WPB Seeks Cooperation

WPB's Tools Division is sending out a second appeal for tool builders who have been assigned critical orders to list their component requirements on Form 3003.

In-again Out-again—Although the Army has just released 16,000 soldiers to work in undermanned war plants, such as these men being checked in at a Buffalo plant, it is now preparing to induct additional thousands from the 26-29 age group out of essential industries. Chances are that some of the new inductees will have to be let out again to fill skilled jobs

Spotting the Air News

1945 May Equal 1944

Possibility that war will continue on both fronts through another year has resulted in WPB boosting airframe schedules to over 1 billion pounds, possibly equalling the 1.1 billion for 1944. The unit schedule for this year will change with the currents of war. At present, it is about 82,250, as compared with 96,369 in 1944.

Certain for maximum production in 1945 is the Superfortress B-29. If present long-range air attack on Japan is narrowed down to 600 miles or so, the B-29 could carry its maximum bomb load, instead of so much gasoline, as it does now. Figures on monthly output of B-29's, in the four plants now producing them, may be announced soon.

Boeing Wichita is delivering about 100 per month; Seattle and Renton, Washington, will go up to 300 or so per month this year; and the total rate per month some time in 1945 will be around 500.

Jet Plane Plans

The new jet-propelled fighter has been mentioned publicly but the Army wants the enemy to learn more about it the hard way. It is in production, its performance is satisfactory by comparison with Germany's best jet planes. The Bell Airacomet, a twin-jetted fighter now often seen in published photographs, is assigned the status of trainer, but is in continued production for the present.

Probably there will soon be news on the Boeing C-97 troop carrier cargo plane, counterpart of the B-29 bomber, which recently set a 6-hour trans-continental speed record. The C-97 can carry Army's medium tanks, big trucks, big guns, several anti-aircraft guns, about 100 casualties or troops. With its speed a single C-97 could accomplish more, in some lines of war service, than a surface ship could, and for less cost.

CAA Development Renewed

A decade ago, the Bureau of Air Commerce (later succeeded by the Civil Aeronautics Authority) set up an Aircraft and Engine Development Section, in an effort to help design a light plane the public would buy. BAC was chiefly responsible for the anti-spin characteristics now featured in many postwar private plane designs. But at that time, short-sighted manufacturers howled down the government's participation in design, and the development section was killed.

Now, T. P. Wright, new CAA Administrator, is setting up a new one with satisfactory answers to renewed protests by industry. After all, a private plane salable in volume is the only hope for a really big aircraft industry, outside of whatever military business may develop. So far, the Budget Bureau has refused funds for Mr. Wright's proposed technical job, but chances are an appeal to congress will succeed. Three major problems, on which manufacturers are not working because they see no promise of early returns, would be taken on by CAA: (1) reduction of propeller noise, which makes suburban airparks unwelcome; (2) perfection of swivel undercarriages for cross-wind landings, which would make possible the use of a single landing strip instead of expansive airports; (3) developing a cheaper engine.

Glider Innovations

Future success of gliders for transport remains doubtful; but new interest in sail planning is promised by development of a very light engine capable of taking the glider or sailplane off the ground and to altitude in the desired area, where it would be stopped and the propeller feathered. One such engine just announced is the Magus, built by Basil Kittell, at Tecumseh, Mich. At present, the Civil Aeronautics Board requires that a flying machine capable of takeoff have all the characteristics of an airplane, but this ruling may be changed. Jet engines for gliders would be still lighter than the reciprocating type. Another possibility is a rocket for attaining altitude, which would then be dropped.

Army's Largest Bomber—This B-19, the largest experimental bomber in the world, has just been fitted with new Allison liquid-cooled engines by the Fisher Body Division of General Motors. Although these engines step up considerably the plane's power, range and load-carrying capacity, they necessitated construction of new, longer nacelles at Fisher plants

COAST SHIPYARD LABOR REDUCED, TEN-HOUR SHIFT ABANDONED

LOS ANGELES—With the completion of a high-urgency group of Navy transports, California Shipbuilding Corporation will drop the 10-hour shifts that were adopted last August, returning to an 8-hour shift, with a three-shift day. The total labor force, recently approximately 32,000, will be reduced and leveled off at about 27,000 by February 1, 1945. Some so-called "excess" manpower, taken on for the transport program, will be dropped, but it is made clear that chronic absentees, in all groups, will be dropped in the reduction.

At the same time, it was announced that contracts for additional cargo ships of the Victory type had been awarded to the yard, all scheduled for completion by December 31, 1945. With the completion of all scheduled ships, at that time, Calship will have built, since September, 1941, a total of 479 vessels of all types, a total deadweight tonnage of about five million tons.

Names in the News

H. C. Ramsey **C. E. Searle**

Clarence E. Searle, vice president in charge of sales since 1932, was named president of the Worthington Pump and Machinery Corp., Harrison, N. J., to succeed **Harry C. Beaver,** who was recently elected vice chairman of the board. At the same time, **Hobart C. Ramsey,** vice president in charge of operations, was elected executive vice president; **Edwin J. Schwanhausser,** vice president in charge of the corporation's manufacturing and sales operations in Buffalo, was elected vice president in charge of sales; and **Leslie C. Ricketts,** manager of the Harrison works, was elected a vice president.

William H. Weimer has been elected president of the Davis and Thompson Co., Milwaukee, Wis. Formerly executive vice president, Mr. Weimer has been with the company since 1911. **G. L. Otto,** chief engineer for the past 12 years, succeeds Mr. Weimer as vice president.

Walter W. Bertram has been elected vice president in charge of sales and **Robert J. Howison** has been appointed sales manager of the Morse Chain Co., division of the Borg-Warner Corp., Ithaca, N. Y., and Detroit, Mich. Mr. Bertram was formerly sales manager and Mr. Howison was in charge of automotive sales.

W. W. Bertram **R. J. Howison**

H. E. Preston has been named vice president in charge of engineering of the American Engineering Co., Philadelphia, Pa.

L. M. Parsons has been appointed assistant to the vice president in charge of sales of the United States Steel Corp. of Del.

John H. Middlekamp, recently resigned director of the Automotive Div., War Production Board, has been appointed manager of the Government Dept., Mack Trucks, Inc., New York, N. Y. Mr. Middlekamp will continue as consultant to WPB and will retain his chairmanship of the Truck Committee of the CPRB.

J. H. Middlekamp **H. O. Menck**

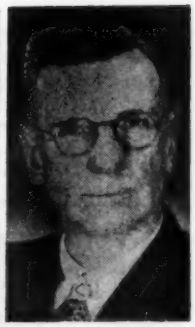
Herman O. Menck, vice president and works manager of the Harnischfeger Corp., Milwaukee, Wis., was elected president of the National Founders Association at their annual meeting.

Leon R. Baker has been appointed European manager for Lempco Products, Inc., Bedford, Ohio. Mr. Baker has been connected with the machine tool industry in Great Britain, America and on the Continent for the past 20 years.

G. F. Gerhauser has been named chief tool engineer at Consolidated Vultee Aircraft Corporation's San Diego division. Mr. Gerhauser, former assistant chief tool engineer, replaces **E. P. Meyers,** resigned.

Morgan D. Douglas, recently appointed general manager of the General Motors Corporation's truck and coach division, has been elected a vice president of the corporation.

David C. Prince, vice president of General Electric Co., Schenectady, N. Y., has taken charge of the company's general engineering laboratory.



John M. Olin **John R. Munn**

John R. Munn has been elected president of the Elastic Stop Nut Corp., Union, N. J., succeeding the late **W. T. Hedlund.** Mr. Munn has been a director of the firm since its inception in 1927.

John M. Olin, former first vice president of the Olin Industries, Inc., has been named president of the firm succeeding his father, **Franklin W. Olin,** who resigned after 52 years of active management of the company he founded. **Spencer T. Olin,** Western vice president, succeeds his brother as first vice president.

Irving B. Babcock has been named president of the Aviation Corp., New York, to succeed **Victor Emanuel,** who has been elected chairman of the board. Mr. Babcock was formerly president of the Yellow Truck & Coach Manufacturing Co. and vice president of General Motors Corp.

Henry Nelson, on leave from the International Harvester Co., has been appointed director of the War Production Board's new aircraft division. **Morton H. Wilner** was appointed deputy director.

William R. Hill has been named general sales manager of industrial and commercial sales of the Warren Steam Pump Co., Inc., Warren, Mass.

J. J. Wallbillich has been appointed general factory manager of Fisher Body fabricating plants to succeed **Delmar S. Harder, resigned.** Mr. Wallbillich in the past three years has served as director of the ordnance specialties and machine section of Fisher Body.

LeRoy A. Petersen, executive vice president of Otis Elevator Co., New York, N. Y., has been elected president to succeed the late **Jesse H. VanAlstyne.** Mr. Petersen has been with Otis since 1921.

E. H. Farrell, former regional chief of the Machine Tool Div., War Production Board, has been named sales manager of the Hasco Machinery Co., Newark, N. J. During the past 18 months, Mr. Farrell has been

engaged in compiling a complete inventory of government-owned machine tools and equipment.

BUSINESS ITEMS

E. Reiniger

C. W. Burgess

The Cincinnati Milling Machine Co. and **Cincinnati Grinders, Inc.,** are now serving their customers in the Baltimore and Washington, D. C., territories through their sales subsidiary, **Cincinnati Milling and Grinding Machines, Inc.,** with an office located in the Washington Building, 15th and New York Avenues, N.W., Washington, D. C. **E. Reiniger,** factory specialist, will be associated with **C. W. Burgess,** who is located in the Washington office. In addition, Mr. Reiniger will continue to serve as factory specialist in the territory of the **W. E. Shipley Machinery Co.** in Philadelphia. This direct field service will provide service to the manufacturing industries, governmental agencies and foreign purchasing commissions in the territory covered. **Clarence A. Thumm,** who has acted as the companies' exclusive dealer since 1929, announced his retirement from active agency business December 31.

The Ready Tool Co., Bridgeport, Conn., has been sold to the **United Tool and Dies Corp.,** Hartford, Conn.

Fred Eldean Organization has opened a Detroit office in the Penobscot Bldg., Detroit 26, Mich.

A Pacific northwest office for the iron and steel division of **Kaiser Co., Inc.,** has been opened in the Corbett Bldg., Portland, Ore., with **Fred E. Lord** as district sales manager.

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich., have acquired the "Cal-Cutter" line of standard and special carbide tipped milling cutters, which will continue to be marketed by the **Cal-Cutter Co.**

The **W. B. Jarvis Co.** and the **Doehler Die Casting Co.** have merged and will be known as **Doehler-Jarvis Corp.**

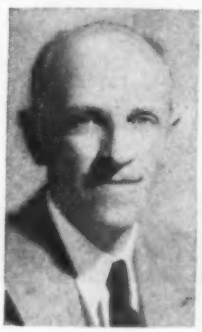
Air Reduction Co., Inc., New York, N. Y., has formed the **Airco Export Corp.** to consolidate and direct the export business of its subsidiaries. **L. A. Hull,** vice president of Air Reduction, has been named chairman of the new company.

All sales of Reid surface grinders and parts are now direct with the plant and main office of the **Reid Brothers Co., Inc.,** Beverly, Mass.

G. A. Gray Co., Cincinnati, Ohio, has appointed **Luther & Pedersen,** 565 W. Washington Blvd., Chicago 6, Ill., as its exclusive representative in the Chicago territory.

Jones & Laughlin Steel Corp., Pittsburgh, Pa., has purchased from **Talon, Inc.,** their electric welded tube plant, at Oil City, Pa.

OBITUARIES



A. L. Parker

H. M. Wylie

Arthur L. Parker, 60, founder, president and general manager of the Parker Appliance Co., Cleveland, Ohio, which he founded in 1924, died suddenly January 1.

Howard M. Wylie, 59, died December 25 at his home in South Norwalk, Conn., after a long illness. Mr. Wylie, retired vice president and director of the Nash Engineering Co., was with the firm from 1915 until 1942 as sales engineer, sales manager, director, assistant secretary and vice president in charge of sales.

John W. Pauling, 55, vice president of the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., died suddenly January 17 in Chicago.

William Knight, 64, passed away at his home in Rutherford, N. J., December 26. For the past two years Mr. Knight was inspection methods engineer for the Curtiss-Wright Aeronautical Corp., propeller division, Caldwell, N. J. Prior to 1942, he was with the Ford Motor Co., Crocker-Wheeler Electrical Mfg. Co. and General Electric Co.

George S. Whyte, 77, chairman of the board of the Macwhyte Co., Kenosha, Wis., died suddenly December 15 at his home. Mr. Whyte founded the company in 1901 and was president for many years.

C. W. Appleton, 70, former counsel and vice president of General Electric Co., died January 10 in Greenwich, Conn. Mr. Appleton became associated with General Electric in 1918.

Lewis C. Kenyon, 57, for 25 years manager of the New York office of the Heald Machine Co. of Worcester, Mass., passed away at his home in Summit, N. J., January 9.

John P. Tierney, 53, president and treasurer of the General Machine Corp., Boston, Mass., died January 13.

Lloyd R. Smith, 61, chairman of the A. O. Smith Corp., Milwaukee, Wis., died December 23 at his home. Mr. Smith became president of the firm in 1913 and was responsible for building it to its present size.

Howard S. Welch, 51, export sales manager of the Sperry Gyroscope Co., New York, N. Y., died January 11 of injuries suffered in an automobile accident while in Canada on a business trip.

Raymond J. Blyth, 52, personnel director for Warner & Swasey Co., Cleveland, Ohio, until his retirement two years ago, passed away in Tuscon, Ariz., January 2.

A. P. Steiner, 71, formerly chief engineer and superintendent of the Landis Tool Co., Waynesboro, Pa., died January 8. Mr. Steiner had been connected with Landis since 1899.

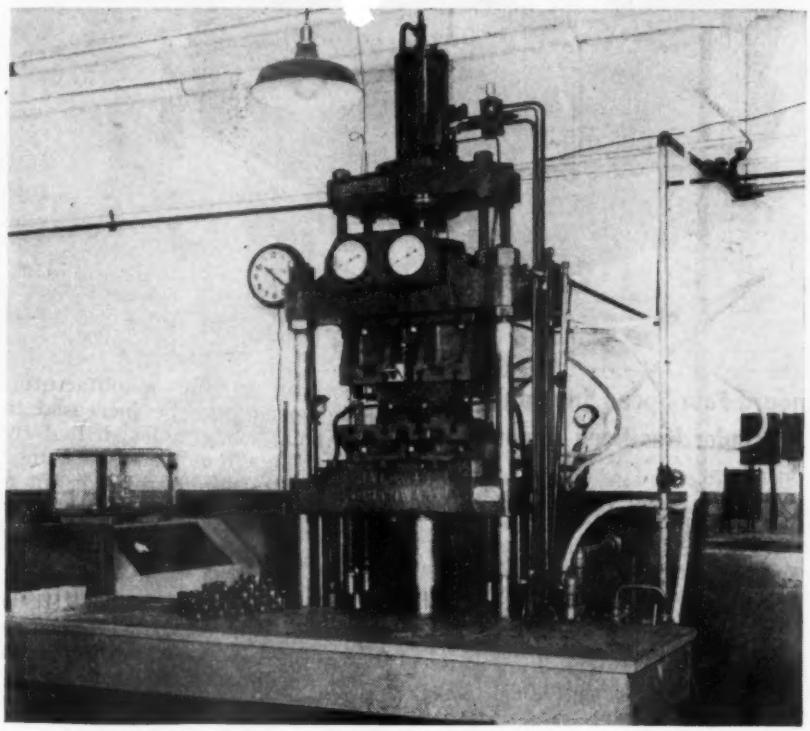
MEETINGS

American Management Association, Annual Personnel Meeting. Palmer House, Chicago, Ill. Feb. 14-16. J. O. Rice, 330 West 42 St., New York 18, N. Y.

American Society for Testing Materials, Spring Meeting. Hotel William Penn, Pittsburgh, Pa. Feb. 28. Robert J. Painter, Assistant to the Secretary, 260 So. Broad St., Philadelphia 2, Pa.

Society for the Advancement of Management. Spring Conference. Drake Hotel, Chicago, Ill. March 16-17. Edward A. McTague, Executive Director, 29 West 39 St., New York, N. Y.

Shop Equipment News



Baldwin "hyspeed" plastic press

Baldwin-Built Hydraulic Plastic Molding Press Cuts Material Cost

Baldwin Locomotive Works, Philadelphia 42, Pa., has built a 75-ton vertical hydraulic "hyspeed" plastic-molding press that pre-heats the material electronically to attain faster production, along with economies in original and subsequent costs.

Development of the press is the result of collaboration between Baldwin, The Bryant Electric Co., Bridgeport, Conn., the Electronic Division of Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. and the Monsanto Chemical Co., Springfield, Mass.

High-frequency preheating of the plastic has made possible the sharp reduction of curing time, to the point that 20 percent more production was attained from an experimental 6-cavity mold than was previously gained from a standard 24-cavity compression mold. Corollary to this is a saving of several thousands of dollars for the smaller molds.

The preheating reduces the pressure requirement and hence a smaller press, costing approximately one-third the price of a straight compression press, is sufficient. Also, the molds used in such a press are estimated to have a 30 percent longer life, while it is feasible to make them of more easily hobbed materials.

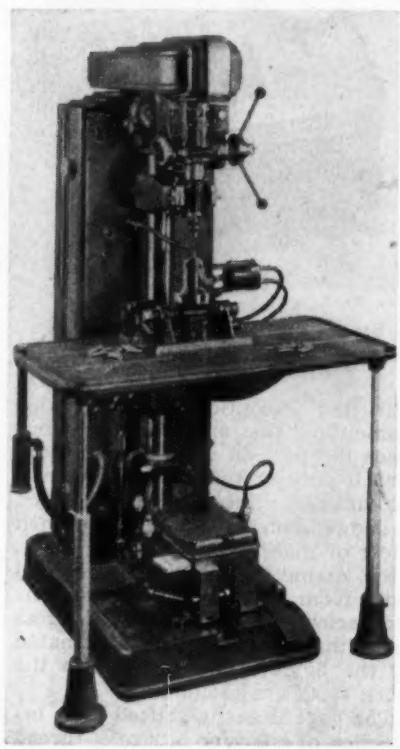
A hydraulic plunger atop the press forces the preheated material into the mold. This unit is operated with a self-contained oil pump.

The press is said to do a precise extrusion job which not only effects a 12½ percent saving in plastic materials but brings about considerable saving in finishing. There is said to be decided savings in "flash" or waste material and rejects.

Zagar Holding Fixture Speeds Operation of W & S Tapper

A Zagar Air-O (air-operated) holding fixture, manufactured by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, does not move vertically in closing. This is said to make possible holding the work to close tolerances in second operations.

Designed for use with the new Warner & Swasey precision tapping and threading machine, a special treadle-controlled mounting tips the fixture about 20 deg. for loading and unloading, saving the time that would be consumed in raising the spindle more than an inch above the work. Automatic valves are installed at the control box to open and close the collet when the fixture is tilted for loading and unloading. Air pressure operates merely the opening and closing mechanism; fluctuations in air line pressure does not affect the holding power of the fixture. Standard 14 AC No. 2 collets are used.



Zagar holding fixture

Enthone Alumon Process Simplifies Plating Aluminum

The Alumon process for preparing aluminum for electroplating has been announced by The Enthone Co., 490 Elm St., New Haven, Conn. Electroplating of all types of aluminum, in both rack and bulk work, is possible. After cleaning, a short dip in the Alumon solution produces an active alloy base which can be subsequently copper or silver plated. Thereafter it can be electroplated with other metals.

It is said that work plated by the Alumon process can be subjected to severe distortion without flaking.

Bryant Production Thread Gages Simplify and Speed Inspection

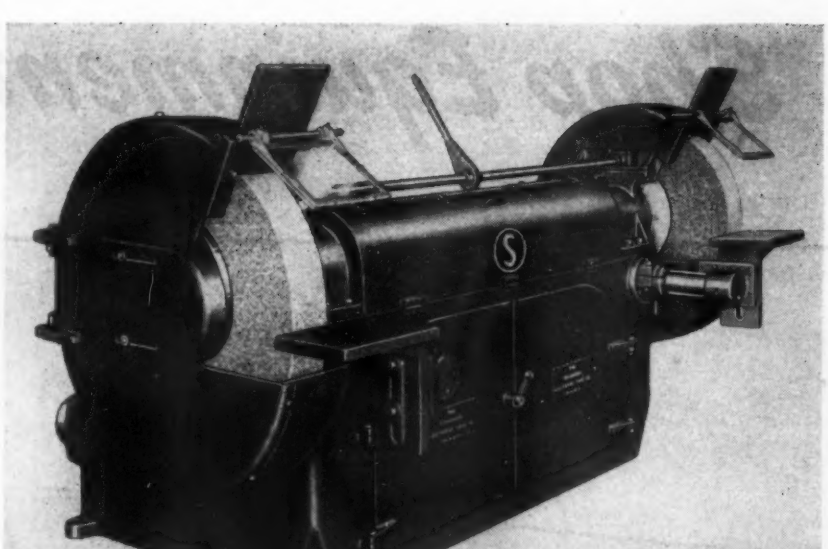
Production thread gages in three capacities are now available from Bryant Chucking Grinder Co., Springfield, Vt. The three different sizes have capacities of ¼ to 1 in., 1 to 2½ in. and 2½ to 5 in. These types are manufactured both for external and internal threads. A fourth, special, size covers the larger size threads and is operated electrically.

The gage is said to give complete over-all inspection of the thread

Bryant Production Thread Gage

with the exception of the major diameter. The operator need but place the part on the work rest and turn it once or twice, while reading the dial gage; this action is described as showing on the dial the combined effect of inaccuracies in lead, taper, pitch, diameter, minor diameter and tooth form or burrs and surface inaccuracies. Any chance of cross threading is purportedly eliminated by the flexible plate on which the work rests are mounted.

The gage is easily shifted from inspection of one type or size of thread to another, by removing three screws and replacing the contact elements.



Standard 30 in. snagging grinder

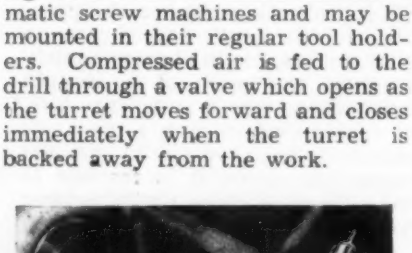
Standard Four-Speed Snagging Grinder Has Been Announced

Model No. 75 standard super duty 30 in. snagging grinder, produced by The Standard Electrical Tool Co., 2480 West 6 St., Cincinnati 4, Ohio has four speeds of 1,200, 1,375, 1,675 and 1,950 r.p.m. to maintain 9,500 surface ft. per min. The two 30 × 5 in. resinoid bond wheels are driven by a 30 hp. motor. Interlocking control prevents overspeeding of the wheels.

The heavy duty work rests measure 6 × 11 in. Wheel flanges are 15 in. dia. for 12 in. bore wheels. Overall spindle length is 92 in. with spindle height of 33½ in.

Keller Pneumatic Screw Machine Drills Up Accuracy and Speed

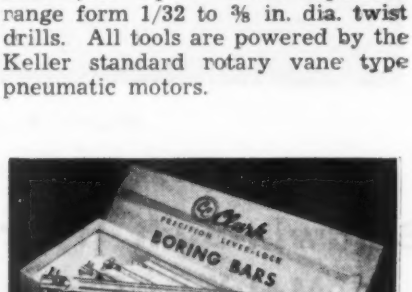
Air drills announced by Keller Tool Co., Grand Haven, Mich., are designed for use on hand and automatic screw machines and may be mounted in their regular tool holders. Compressed air is fed to the drill through a valve which opens as the turret moves forward and closes immediately when the turret is backed away from the work.



Keller pneumatic drills

According to the manufacturer, drilling speed may be increased to 3,500 r.p.m., while holes drilled by this method will not run out, since the air drill spindle revolves in a direction opposite to that of the work in the screw machine spindle.

The screw machine drills are available in three sizes and eight models, having speeds of 1,200, 2,800 and 3,500 r.p.m. Drill capacities range form 1/32 to ⅜ in. dia. twist drills. All tools are powered by the Keller standard rotary vane type pneumatic motors.

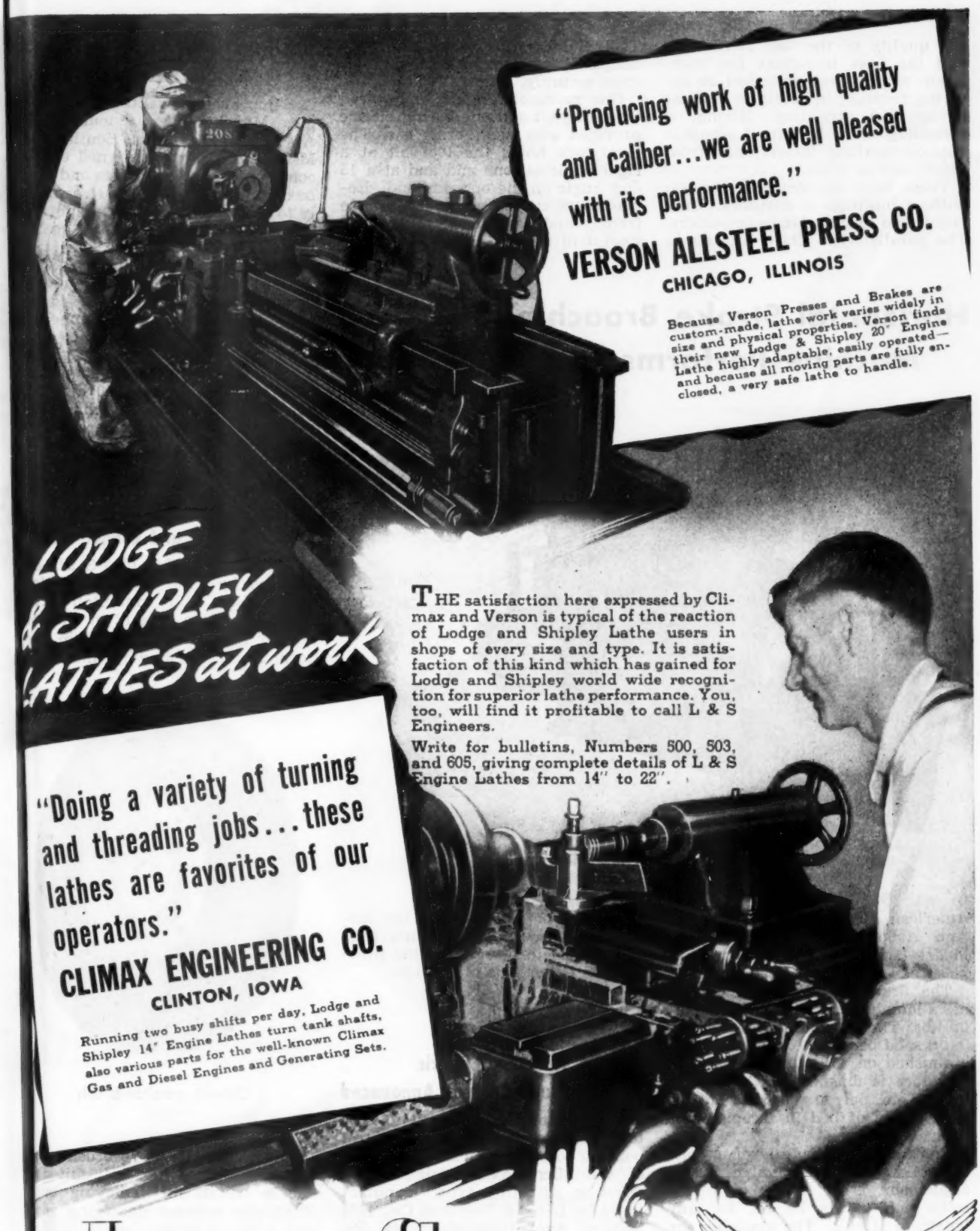


Precision Lever-Lock Boring Bar set

Clark Lever-Lock Boring Bar Cuts Solid Forged Bar Expense

The Precision Lever-Lock Boring Bar, produced by Robert H. Clark Co., Beverly Hills, Calif., is available in sets of four, in sizes 3/16 × 5 in., ¼ × 6 in., ⅜ × 7 in. and ½ × 8 in. Solid round tungsten carbide bits in sizes down to 3/32 in. dia., for use in these bars, are said to be available from several tool manufacturers.

The design, sturdy construction,



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VERSON ALLSTEEL PRESS CO.

CHICAGO, ILLINOIS

Because Verson Presses and Brakes are custom-made, lathe work varies widely in size and physical properties. Verson finds their new Lodge & Shipley 20" Engine Lathe highly adaptable, easily operated—and because all moving parts are fully enclosed, a very safe lathe to handle.

LODGE & SHIPLEY LATHES at work

"Doing a variety of turning and threading jobs...these lathes are favorites of our operators."

CLIMAX ENGINEERING CO.

CLINTON, IOWA

Running two busy shifts per day, Lodge and Shipley 14" Engine Lathes turn tank shafts, also various parts for the well-known Climax Gas and Diesel Engines and Generating Sets.

THE satisfaction here expressed by Climax and Verson is typical of the reaction of Lodge and Shipley Lathe users in shops of every size and type. It is satisfaction of this kind which has gained for Lodge and Shipley world wide recognition for superior lathe performance. You, too, will find it profitable to call L & S Engineers.

Write for bulletins, Numbers 500, 503, and 605, giving complete details of L & S Engine Lathes from 14" to 22".

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

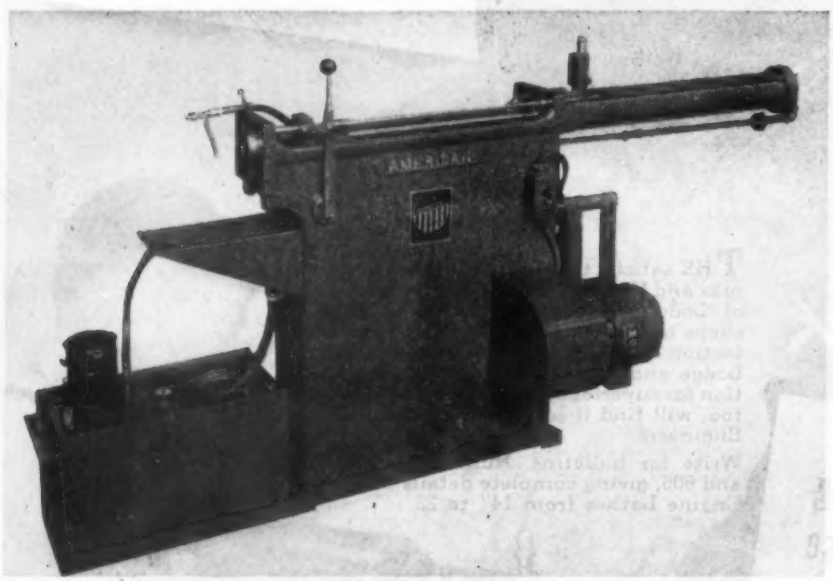
GINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

the quality of the tool steel used, and the heat treatment for maximum rigidity are described as assuring accuracy in precision internal boring and threading. Boring or threading to the bottom of a hole is possible without interference from set-screws or bolts.

These bars are designed for use without bushings or adaptors. They require no special clamps or holders. The parallel type Clark Adjustable Tool Holders, for which they are designed as a companion tool, holds them securely.

One precision ground high speed threading bit and one boring bit are provided with each boring bar. The lever-lock holds the tool bit at a right angle on one end and at a 15 deg. angle on the opposite end. Replacement cutters are readily made from round carbon, or high speed steel drill rod.

Horizontal Stroke Broaching Machine Performs Push-Pull Work



American 20 in. Stroke Broaching Machine

American Broach & Machine Co., Ann Arbor, Mich., announces its Model H-1-20 horizontal 1 ton, 20 in. stroke broaching machine.

The draw head of this machine has a long bearing with bronze take-up jibs. The ways are of steel bolted in on solid bed frame. The faceplate is finished on full surface. The inside face is finished to a size large enough to permit bushings to be used inside of bed in faceplate for push operations.

Control is by a hand lever operating a 4-way hydraulic valve. Stroke adjustment is by means of a stop collar which can be set for any length of stroke. The machines are built for pull or push broaching, with a 20 in. max. stroke. The maximum time for the full cutting stroke is 4½ seconds.

Approximate speeds are 18 to 24 ft. per min., varied through an automatic diameter changing drive pulley.

The hydraulic units are mounted on a common base, permitting quick removal from the back of the machine for servicing. Pressure gage is mounted to permit reading pressure on either side of cylinder.

Leeds & Northrup Electric Temperature Control Announced

Regulation of electric input to hold temperatures at a selected control point or to a program is the purpose of the Micromax electric control, duration adjusting type, manufactured by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa. Input is either "full-on" or "full-off." Regulation is obtained by controlling automatically the time during which current is "on" and "off."

The unit provides automatic droop-correction. It can be equipped with overshoot control, valuable when a furnace or other unit is coming up to temperature.

Improved Duralite Safety Goggle Has Larger Eyecup

An improved Duralite safety goggle, Model 301A, announced by American Optical Co., Southbridge, Mass., has a newly designed eyecup considerably larger in area and more face conforming. Shaped separately to fit the contour of the right and left eye, the cups fit snugly against the face and protect the eyes from objects striking from any angle.

New nasal section and enlarged facial contact roll conform to the shape of the face. Air channels in the edge of the eyecups, plus extra side perforations provide greatly increased ventilation. This goggle is supplied with either 50 mm. Super Armorplate lenses in white glass, or in Calobar medium, dark or extra dark shades.

Osborn Power Brush Faster Cutting and Longer Lasting

Monitor brush No. 1409-S-22, announced by The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland, Ohio, is a 12 in. monitor section filled with a 0.005 in. Osborn power brush wire and has a

Osborn monitor brush

1¼ in. arbor hole. The brush is described as especially well suited to ductile metals for removing burrs effectively without damaging adjacent surfaces of the part.

High level, uniform cutting ability is said to be maintained throughout the life of the brush. According to the manufacturer, in the applications for which it has been especially designed, the brush has a cutting rate four times as great and brushing life three times longer than the best fine-wire brushes heretofore manufactured.

LET Cadillac STANDARDS PROTECT *Your* STANDARDS!

Precision and quality always have been primary considerations at Cadillac Gage Company. For Cadillac engineers realize that upon the precision of their workmanship and the quality of the gages they manufacture depend the quality of the work produced by Cadillac Gage customers.

Unsurpassed quality, painstaking workmanship and the highest standards of precision, however, are not the only reasons why production men in ever increasing numbers specify Cadillac for their thread gaging equipment. Cadillac's immense stock of over 10,000 gages in all standard sizes provides gages for immediate delivery—a time-saving and money-saving feature.

Next time you order thread plug or thread ring gages, specify Cadillac . . . and let Cadillac standards protect your high standards of manufacturing.

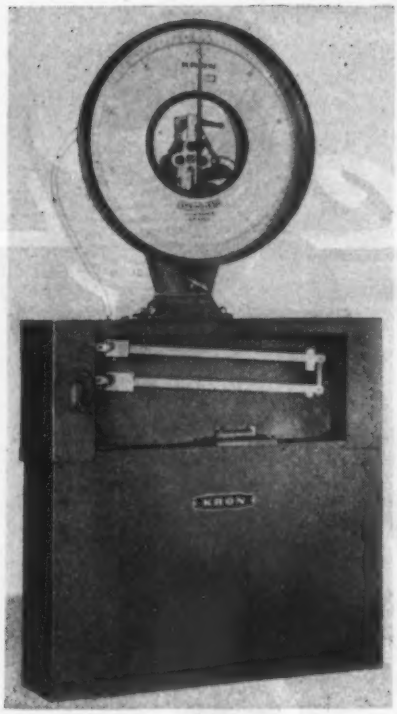
Cadillac

GAGE COMPANY

20316 HOOVER ROAD • DETROIT 5, MICH.

. . . 5 TO 20 TIMES THE WEAR WITH ★ STELLITE ★

Have you a job that is really tough on gages? Try Cadillac STELLITE Thread Plug Gages! See for yourself that these gages will give 5 to 20 times the wear of regular steel gages.



Kron unit weight cabinet

Kron Scales Feature Accuracy With High Gross Capacity

The Kron unit weight cabinet attachment, manufactured by The Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia 24, Pa., makes possible a high gross weighing capacity scale with low and accurate fractional weight dial chart graduations.

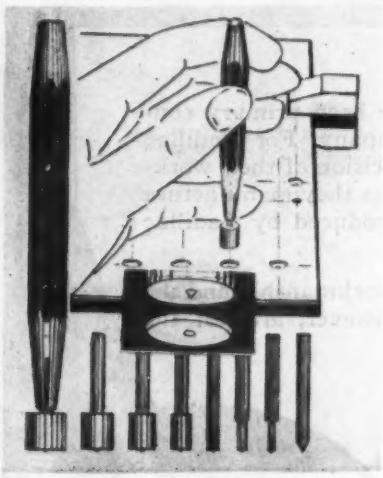
By rotating the handle on the cabinet front, from 1 to 7 unit weight increments, each equivalent to the dial chart capacity, can be added to the lever system to increase the gross weighing capacity of the scale. The weight increments are indicated in a target on the dial chart as they are added to the lever system. Flexible cables allow this target to swivel to any position.

Allen Templet Punches Take Less Space and Investment

Templet transfer punches manufactured by H. D. Allen, 3201 Casita Ave., Los Angeles 26, Calif., are described as having points uniformly concentric with the bodies and accurate to size within 0.0004 in.

Inasmuch as punches are used with a universal holder, savings in weight, storage space and investment are possible. The octagonal holder also takes a scriber and prick punch, is of comfortable size and proper weight and cannot roll.

Three types are available from stock: 1. Punches for light gage templets are made in 19 standard diameters from 0.040 to 0.375 in; points are 0.020 in. high; one holder serves for all punches. 2. Heavy duty punches are made in 7 standard diameters from ⅛ to ½ in. and have a universal holder; the points on these punches are several times larger than those of the punches for light work. 3. Solid type Allen punches are made in 7 sizes from ⅛ to ⅝ in.



Allen templet transfer punches

Sheffield electronic piston ring inspector

Sheffield Electronic Piston Ring Checker Fast, Accurate

The electronic piston ring inspector announced by The Sheffield Corporation, Dayton, Ohio, automatically inspects the trueness of periphery and the width of gap of a specific size of piston ring.

Should a piston ring be out-of-round beyond an acceptable point, or should the gap be over-size, a red rejection signal is flashed. An undersize gap actuates a yellow signal. If the periphery and gap are within tolerance limits, a green signal flashes on. Trueness of the periphery can be determined within a tolerance of 0.0001 in. The inspection cycle per piece is said to be less than 5 seconds.

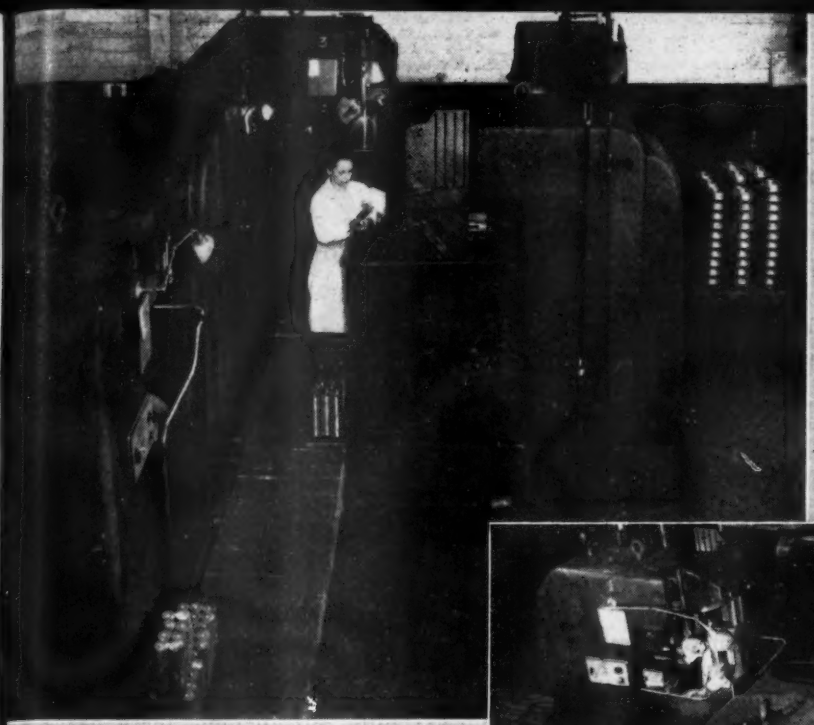
Norflex Polishing Wheels Remove Small Amount Speedily

Norflex solid polishing wheels, manufactured by Norton Company, Worcester, Mass., are available in cork resinoid, fiber resinoid and resilient rubber types. All three types of abrasive wheels and sticks possess a relatively soft and flexible bond that imports a cushion-like action, said to assure a smooth uniform finish. They are designed to remove only a relatively small amount of material, rapidly and economically. The three types differ from each other with respect to the kind of flexible bond that supports the abrasive grain.

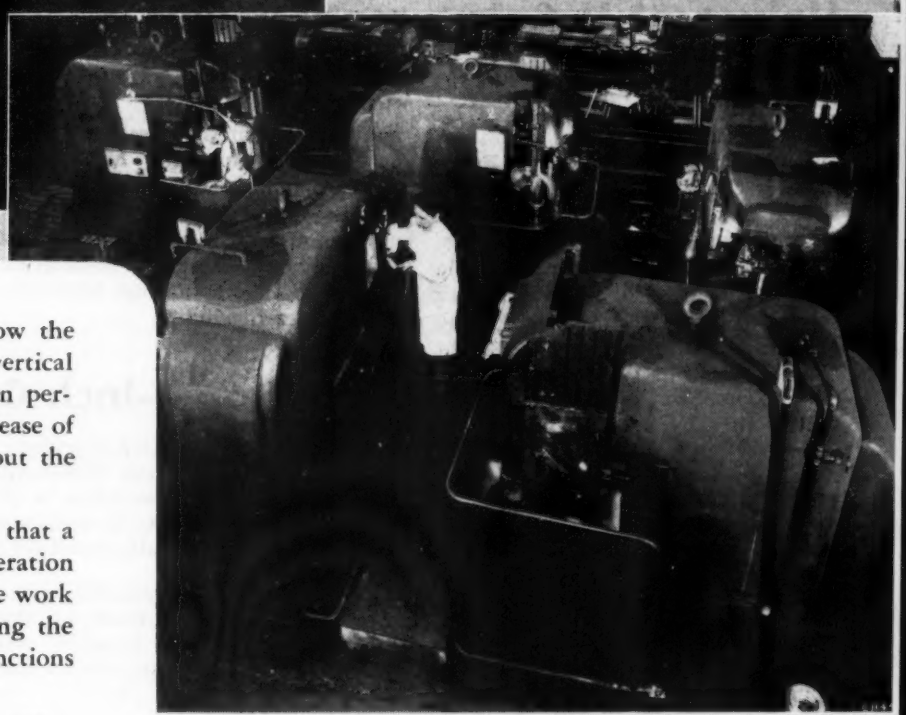
The fiber resinoid type consists of uniformly sized abrasive grains mixed with cotton fibers and held together with a resinoid bond. The smooth cutting action of this wheel enables the operator to remove burrs and break down sharp edges with marked speed and facility and assurance of obtaining a good finish, according to the manufacturer. It can be operated at 7,500 s.f.p.m. in F, the softest grade, and as high as 9,000 s.f.p.m. in the hardest grades, G and H.

Resilient rubber wheels have a

Norflex polishing wheels



A Battery of RIGIDTURNERS *arranged for* HIGH PRODUCTION –LOW COSTS



● The accompanying illustrations show the advantage of the RIGIDTURNER's vertical design. The compactness of construction permits the 5 machines to be arranged for ease of operation and high production without the need for highly trained operators.

The machines are so simple to operate that a woman can quickly "get on" to the operation —all she has to do is load and unload the work and press the start button after inserting the next piece of work—the machine functions automatically from there on.

The battery of machines can handle five different jobs or two or three operations on more than one job. Each machine can finish several diameters on one piece in a single cycle.

By arranging the machines as shown you can finish five jobs in the time of the longest operation on any one of them. One operator can handle all five without undue fatigue during a shift. Your production is continuous—your labor cost exceptionally low.

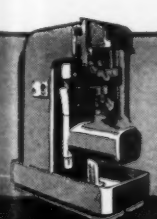
As you look to postwar production, where the cost per piece will have to be low to enable you to operate at a profit in a highly competitive market, it will pay you to investigate the many cost saving factors of RIGIDTURNERS.

Consult a Cleveland Hobbing Engineer on your multiple diameter turning work.

5 MACHINES
5 DIFFERENT JOBS
No skilled help required

• • •

A unique–economical method for turning multiple diameters



The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

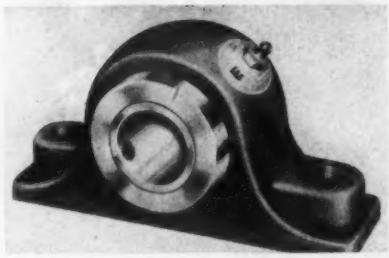
cushion-like cutting action. They are also used for deburring, finishing and polishing, but are not suitable for operation at speeds in excess of 6,000 s.f.p.m. for the harder grades, D and E, while in B, the softest grade, 3,300 s.f.p.m. is the maximum safe operating speed.

Cork resinoid wheels provide a soft polishing action and find their most important application on precision polishing work in cylindrical, centerless, surface and internal grinders.

Dodge-Timken Type E Pillow Block Simply Affixed to Shaft

Type E Dodge-Timken bearing, announced by Dodge Manufacturing Co., Mishawaka, Ind., is available in both pillow blocks and flanged units.

The bearing is fastened to the shaft by means of four headless screws, two on each end of the extended inner race, spaced 120 deg. apart, and extending through clearance holes in the inner race of the shaft. These four set screws provide a positive lock to prevent rotation of the inner race on the shaft.



Dodge-Timken Type E pillow block

The compact and rugged housings are precision machined to close tolerances on automatic machines. Simple, effective labyrinth seals prevent loss of lubricant and protect bearings against damage from dust, dirt or moisture. The bearings are completely assembled, lubricated and adjusted at the factory. While not fully self-aligning, these bearings are said to have enough self-alignment inherent in the design and arrangement of the rollers to compensate for normal misalignment.

Universal U-6 Automatic Miller Speeds Hobbed Thread Output

The U-6 automatic thread miller, manufactured by Universal Engineering Corp., Cedar Rapids, Iowa, is said to give high production and extremely accurate hobbed threads. The hob spindle and work spindle are worm gear driven from the main drive shaft. The work spindle swivels on the bed so that straight or taper internal or external threads can be hobbed with equal speeds and facility by the use of standard hob type cutters and without the need of special taper attachments. One 3 hp., a.c., 220-400 v., 60 cycle motor supplies all power for work spindle, hob spindle and coolant pump.

Set-up and operation are simplified and require no special skill and one operator can easily operate two machines. Operation stops automatically when the threading cycle has been completed. Micrometer graduations on the hob spindle control dial serve to reduce normal set-up time and setting can be held unchanged for duplicate production until such time as normal hob wear necessitates regrinding.

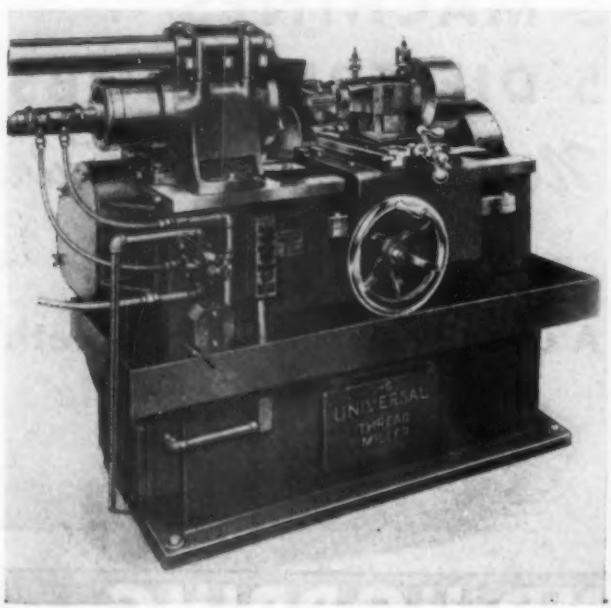
Norton 4-Inch Cylindrical Grinder

The 4-in. Type C cylindrical grinder, manufactured by Norton Company, Worcester, Mass., is available in 12 and 18 in. lengths. It is primarily designed for short length, small diameter work.

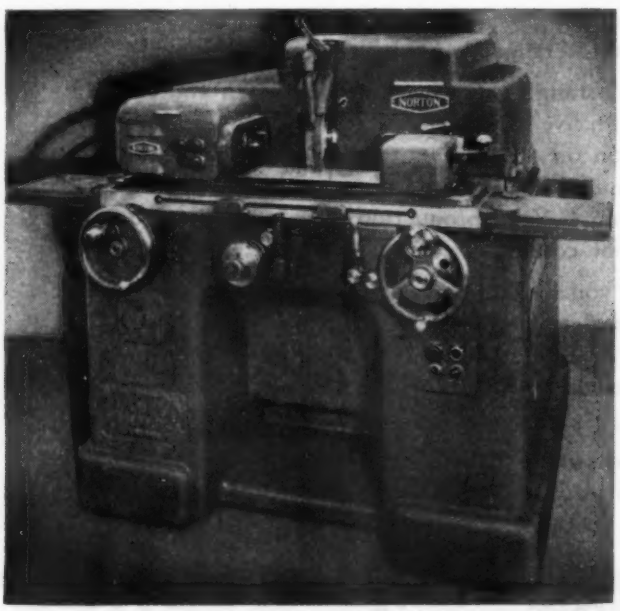
This grinder has hydraulic table traverse, automatic infeed of the wheel at each table reversal and adjustable dwell at each end of the table traverse. The machine is available as plain or semiautomatic with manual or automatic cycle.

Where a semiautomatic machine is desired, continuous wheel feed can be furnished. Works speeds are from 100 to 1,000 r.p.m. Grinding wheels of 16 in. dia. and up to 3 in wide are available for this machine.

Other features include Norton wheel spindle with automatic lubrication and coolant controls.

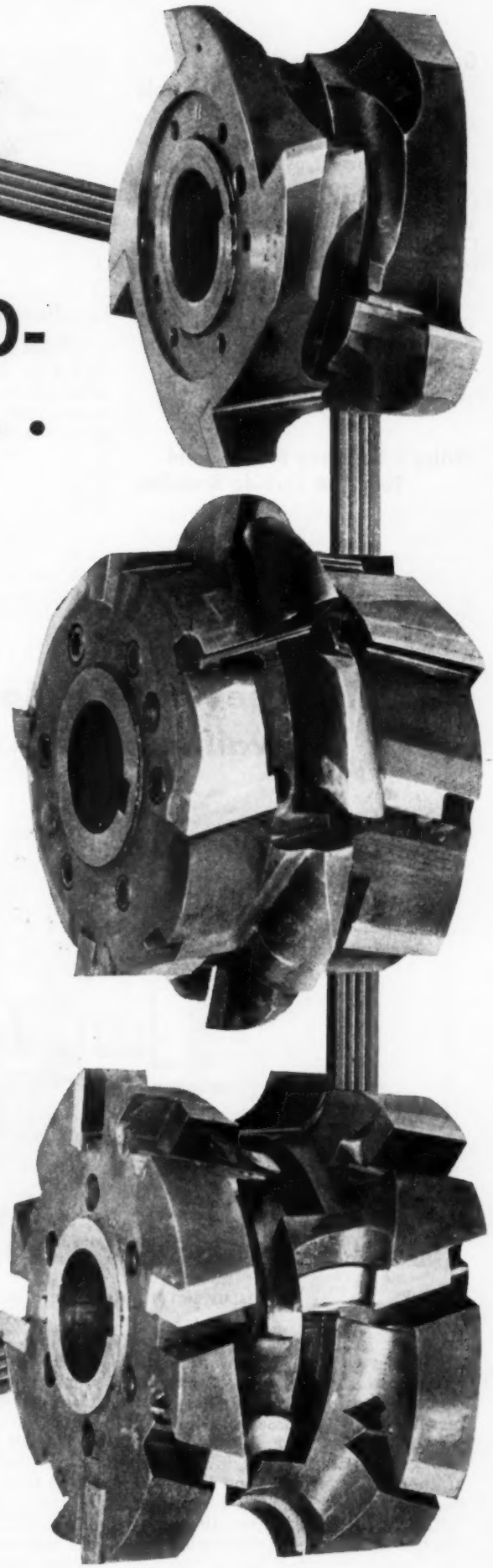


Universal U-6 automatic thread miller



Norton Type C Cylindrical Grinder

What "TOOL-ENGINEERED-TO-THE-JOB"..... *Can Mean to You*



Thompson Products quick-disconnect couplings make it possible for an aircraft engine to be pulled and replaced in the least possible time. They keep planes in the air—and that *counts.*

Simple as these couplings are to handle in the field, they are difficult to produce. Genesee had the confidence and ability to make the kind of form-milling cutters Thompson needed to machine these parts. Castings of an abrasive aluminum alloy had to be held to tolerances measured in tenths of thousandths at points where the wall was very thin and which offered little support to the action of the cut.

At the time Genesee was asked to collaborate on a new milling cutter design, this operation was a very expensive "bottleneck". Thompson engineers had an idea for improving the cutter design and asked Genesee to help. Thompson found them "willing and capable of helping in engineering matters and in making these cutters." Today, **"TOMAHAWK"** ground profile relieved cutters are turning out 2-½ to 3 times the number of pieces per grind.

In the battles for output and cost, you may be able to approach—but you can't beat **"TOMAHAWK"** engineered-to-the-job tools. Why not talk over *your* tool requirements with a Genesee Field Engineer? There is one near you.

GENESEE TOOL COMPANY
FENTON, MICHIGAN

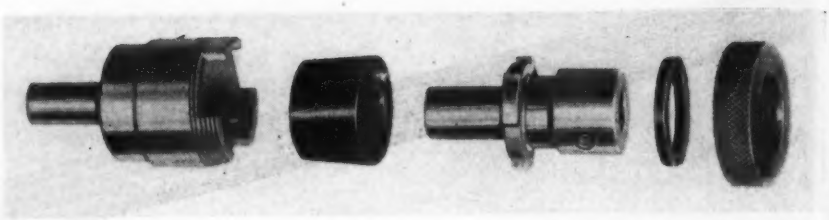
* Registered trade mark

General Electric Dust Tight Enclosure for Aircraft Controls

For housing combinations of aircraft control devices a standard dust-tight enclosure is available in various overall lengths to 19 in. from General Electric, Schenectady, N. Y. The enclosure accommodates various G-E aircraft control relays and contacts with ratings up to and including a 100 amp. aircraft contactor. Construction of aluminum with cast aluminum frames gives lightness and mechanical protection to the housing.

Willey's Company Makes Solid Tungsten Carbide Broaches

Solid tungsten carbide broaches, in diameter from 0.250 to 1 in. and moderate lengths, are manufactured of Willey's metal by Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit 1, Mich.



Tool-Flex flexible tool holder

Tool-Flex Tool Holder Eases Shock and Corrects Alignment

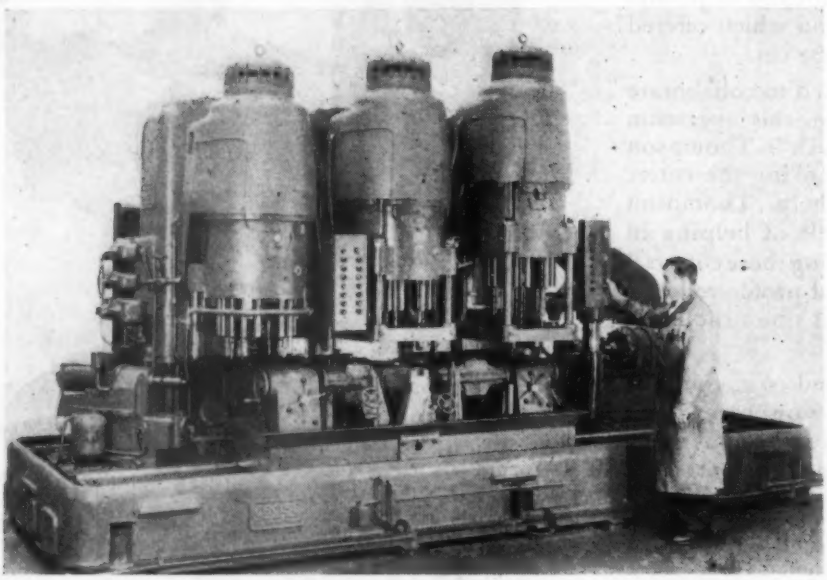
Tool-Flex, a flexible tool holder announced by Richmont, Inc., 215 W. Seventh St., Los Angeles 14, Calif., utilizes a simple, inexpensive, oil-resistant Neoprene rubber insert as the universal joint in which the tool floats. It is designed expressly as a follow-up tool. It compensates for both parallel and angular misalignment of turret head or tail stock with the lathe spindle and permits reamer, counterborer or hone to follow. By relieving side pressure, it prevents bell-mouthing, oversize holes and tool marks, while reducing wear on tool and jib bushings and producing more accurate close tolerance work.

The rubber insert, by absorbing shocks in such operations as tapping and portable tool drilling, greatly reduces tool breakage, and vibration in jibs is practically eliminated.

When used with portable drills, Tool-Flex is said to prevent binding and to compensate for the incorrect position of the tool as held in the hand.

Tool-Flex flexible tool holders are made for both large and small lathes with turret heads, engine lathes, drill presses, tappers and ¼ in. and ½ in. portable drills. They are avaliable with straight shanks ½ to 2 in., female taper 2-A or 33 for drill press spindle and Morse taper shanks sizes Nos. 2, 3 and 4. Chuck arbors, reamer holders and Morse taper sleeves are interchangeable in any style body of the same size.

Special Three-Station Machine Available for Axle Housings



Cross special transfer type machine

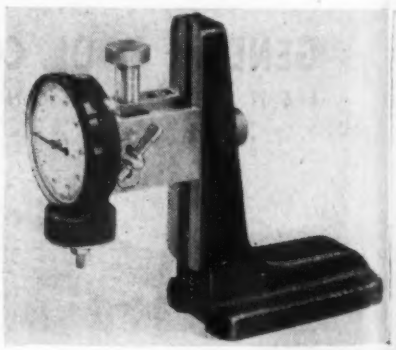
The Cross Company, Detroit, Mich., announces a special transfer type 3-station machine which drills, countersinks and taps assembly holes in the bowl face, and simultaneously two grease drain holes in the side of the bowl, in front and rear axle housings of four and six-ton trucks.

The machine has three 10 hp. independently powered, multiple spindle heads mounted on a common base with a table that indexes the work from station to station. The table carries a work-holding fixture which is arranged to accommodate both front and rear axles. The multiple spindles are arranged in the heads to permit working on the two different diameters of bowl faces. All elements of the machine operate automatically by electric push button control.

Bartelt Non-Ferrous Pedestal Indicator for Magnetic Field

The non-ferrous model Pedestal Indicator manufactured by the Bartelt Engineering Co., 1412 Partridge Ave., Beloit, Wis., is designed for use in an active magnetic field. All parts of this Model DNF-10, except the dial indicator, are constructed of hard brass.

The dial of the DNF-10 has a first division reading of 0.001 in. Overall height is 8 in. with a range of approximately 4 in. from the base surface upward.



Bartelt non-ferrous indicator

Photo courtesy of
Van Norman Company

6 OUTSTANDING ADVANTAGES

of McCrosky *Jack-Lock Milling Cutters

* Patented

1 **RIGIDITY**—Jack-Lock tools have the rigidity of solid tools. The blades *can not* work loose under the thrust of the cut.

2 **EASY BLADE RELEASE**—Simply retracting the screw releases the wedging pressure. No hammering or pounding to damage the blades or cutter body.

3 **ACCURATE ADJUSTMENT**—Fine pitched screws in back of each blade assure positive, extremely uniform blade adjustment.

4 **MINIMUM BLADE LOSS IN REGRINDING**—a result of uniform and accurate blade adjustment: more grinds per blade, a special advantage on carbide-tipped jobs.

5 **FEWER TOOLS NEEDED**—Because the tools can be adjusted and ground more quickly, and with greater accuracy, fewer cutters are required to keep a job in continuous production.

6 **WIDE RANGE OF SIZES**—Including face, shell end, half-side and staggered tooth cutters, 3″ to 20″ in diameter.

If you don't have full details about this shop-proved line—standard for 40 years—send for Bulletin 16-M. Do it today!

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS

Block Type BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS

Turret TOOL POSTS

Vlier Spring Plungers Used As Locators and Ejectors

Spring plungers manufactured by Vlier Manufacturing Co., 4552 Beverly Blvd., Los Angeles 4, Calif., are used as tooling and locating pins, and for breaking oil seal on dies and holding parts against permanent stops.

The spring plungers are described as having uniform pressure for the entire stroke, long plunger bearing and free plunger action. Their concentricity is closely held and they have a rust-proof coating. The

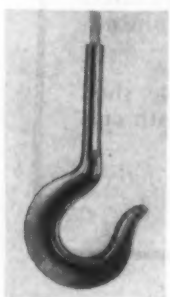
Vlier spring plunger

plunger completely telescopes within the body.

These units are made in sizes ½ × 13, ⅜ × 16 and ¼ × 20 in., with ¼, 3/16 and ⅛ in. plunger ends, respectively. They are positive in action and are said to represent a marked saving in tooling overhead, due to their low cost.

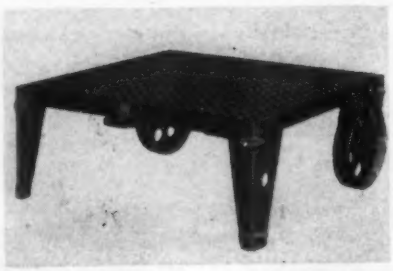
P & N Direct-Line Swaged Hook Is Affixed Faster and Safer

A Direct-Line swaged hook announced by Poulsen & Nardon, Inc., Terminal Box 2398, Los Angeles 54, Calif., is said to offer a faster and safer method of fastening, while eliminating costly splicing, and the rough, dangerous edges that splicing often leaves.



P & N Direct-Line swaged hook

The hook has a straight shank and is made from alloy steel in a precision stamping operation that retains the full strength characteristics of the steel. It has flattened sides, smooth inside surface, rough throat, ample radius and finished point. Tests have shown its holding factor to be in excess of the cable. Sizes are available for 3/16 to 1 in. cable.

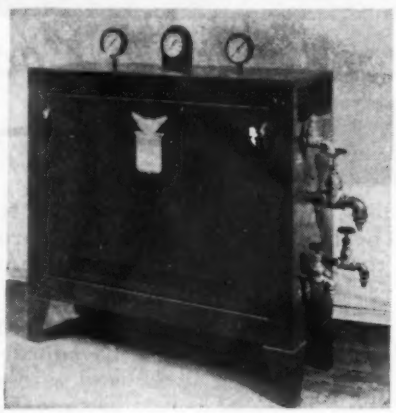


Transport with 4-way floor plate deck

Turner Transport Floor Plate Deck Cuts "Walking" and Warping

The application of a 4-way floor plate to the standard Turner Transport Chassis produced by Factory Service Co., 4615 North 21 St., Milwaukee 9, Wis., keeps metal parts from "walking" off easily when the unit is in motion. Further, the embossments provide point contact with hot materials which allows some air space between them and the steel deck; warping of the steel deck is eliminated.

The floor plate is welded flush with the top of the chassis on the angles of the frame and reinforced on the under side by two heavy angles.



Sherwin-Williams Thermotite equipment

Sherwin-Williams Thermotite Hot Dope Equipment for Rent

The "Thermotite" hot dope spraying system for applying the protective finish to airplane fabrics has been developed by Sherwin - Williams Company, 101 Prospect Ave., N.W., Cleveland, Ohio. Through a system of heating coils, pressure tank, air pump and spray gun, the need for solvents as thinners is eliminated, and the dope warmed to a free-flowing consistency.

The equipment is obtainable on a rental basis.

Built-in-Tap Cuts Thread for Shakeproof Screws' Snug Fit

Shakeproof Inc., 2501 North Keeler Ave., Chicago, Ill., offers the Type 1 Thread-Cutting Screw for metals and the Type 25 Thread-Cutting Screw for plastics. By means of its "built-in-tap" Shakeproof screws are said to cut their own thread in metal and assure maximum thread-contact in all thicknesses of metal or plastic. This feature is described as giving a perfect mating with no "play" between screw and work, providing a stronger, tighter fastening than is ordinarily possible with machine screws in pre-tapped holes.

Scherr Model C Magni-Ray

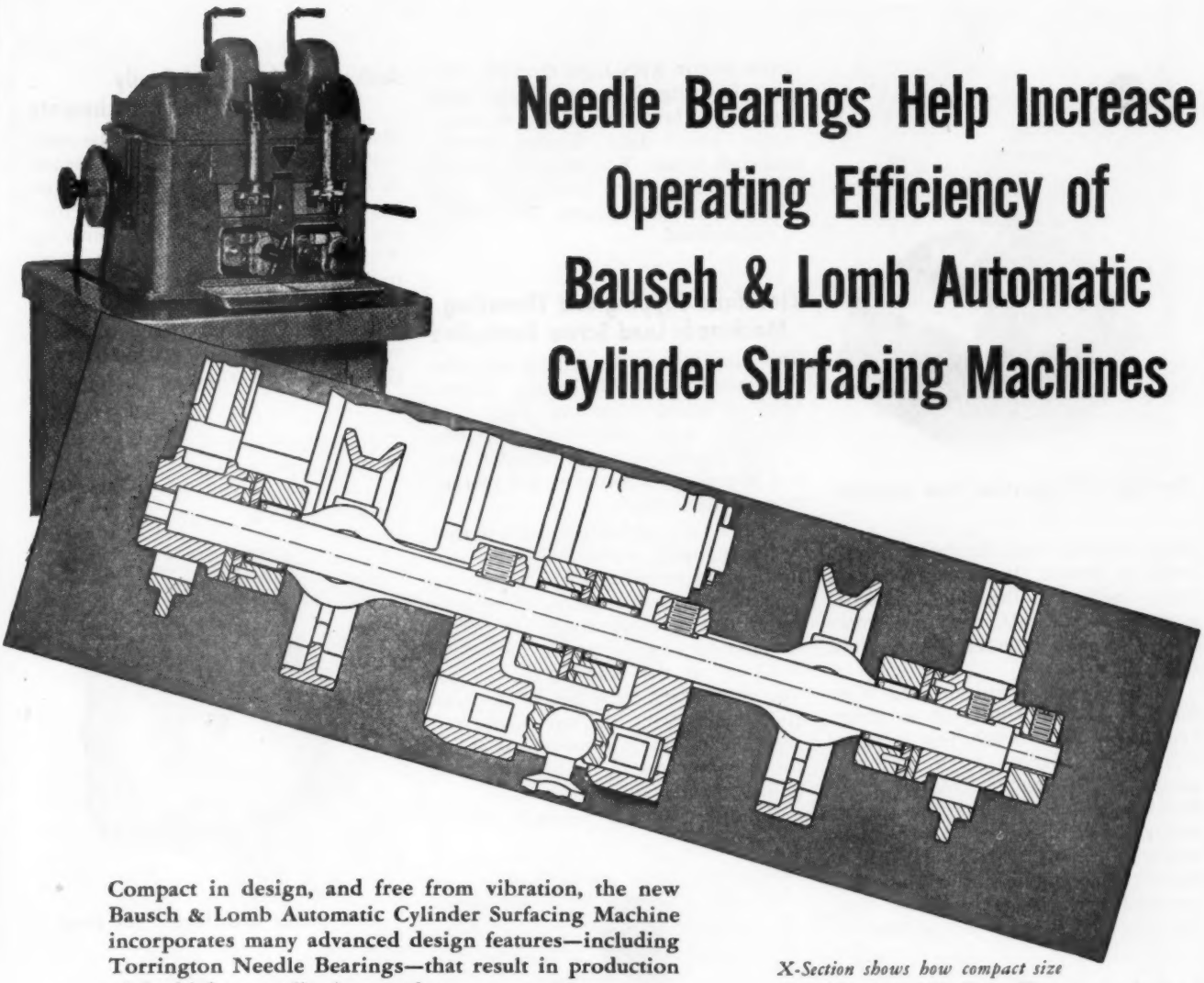
Scherr Model C Magni-Ray For Viewing a Wide Field

The Model C Magni-Ray illuminated magnifier, designed to simplify and speed visual inspection operations over a wide field, is available from George Scherr Co., 200 Lafayette St., New York 12, N. Y. A cast iron base supports the assembly on a 16 in. upright rod, to which the magnifier is fastened by a universal clamping device permitting swiveling in any direction.

Illumination is by two 4 in. long, specially silvered, 25 watt tubular bulbs.

Tennant "K" Industrial Floor Machine Removes, Gathers Dirt

The Model K industrial floor machine, manufactured and marketed by G. H. Tennant Co., 2544 N. Second St., Minneapolis, Minn., is said, in a single operation, to cut loose and pick up incrusted grime, grease,



Needle Bearings Help Increase Operating Efficiency of Bausch & Lomb Automatic Cylinder Surfacing Machines

Compact in design, and free from vibration, the new Bausch & Lomb Automatic Cylinder Surfacing Machine incorporates many advanced design features—including Torrington Needle Bearings—that result in production of the highest quality lens surfaces.

Many manufacturers planning new products can take a tip from this machine. For it clearly illustrates how Torrington Needle Bearings with their unique advantages of compact design, high load capacity, light weight, and efficient lubrication help increase operating efficiency and lower costs.

Consider also the production and sales advantages that stem from the use of Torrington Needle Bearings in your own plans. Complete information on types, sizes, and ratings, along with a list of typical Needle Bearing applications will be found in Catalog No. 30-A. Send for your copy today.

X-Section shows how compact size Needle Bearings aid in design of operating mechanism on B & L Surfacer.

THE TORRINGTON COMPANY
TORRINGTON, CONN. • SOUTH BEND 21, IND.
New York Boston Philadelphia Detroit Cleveland Seattle
Chicago San Francisco Los Angeles Toronto London, England

TORRINGTON NEEDLE BEARINGS

Tennant "K" industrial floor machine

metal cuttings and dirt from heavily trafficed floors. It is claimed that this method eliminates manual scraping, chemicals, soap and water and does not interfere with plant operations.

Dirt and grime are sheared from floors by a heavy duty 16 in. drum type steel wire brush revolving at 1,725 r.p.m., driven by a powerful gasoline or electric motor. The brush hurls metal bits and heavy soilage into a built-in pan hopper, while powerful vacuum fan sucks lighter material into the bag. The machine can also be used for floor sanding and steel wool buffing.

Lo-Hed ¼ Ton Electric Hoist Built for Heavy-Duty Service

The Lo-Hed ¼ ton electric hoist, manufactured by American Engineering Co., Philadelphia 25, Pa., is powered by a ¾ h.p. hoist and

Lo-Hed ¼ ton electric hoist

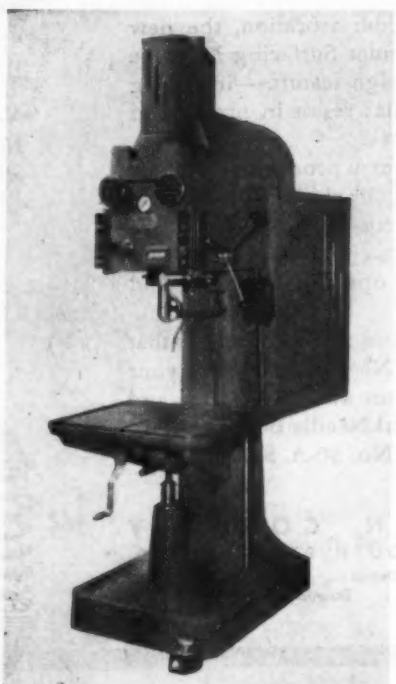
crane motor with high starting torque. Gearing is heavy duty spur type. The lowering brake is automatic, heavy-duty Weston screw-and-disc type. The electric brake, built integral with the motor, has full load torque capacity. The trolley is shockproof.

Cleveland Tapping and Threading Machine is Lead Screw Controlled

The tapping and threading machine developed and built by the Cleveland Tapping Machine Co., 1725 Superior Ave., Cleveland 14, Ohio, is lead screw controlled at all times, yet has rapid approach and retraction of the spindle.

The rapid approach and retraction of the spindle is controlled by two air cylinders which exert no air pressure on the spindle when tapping. The rapid approach can be set to stop anywhere within 5 in. to 0.010 in. of the hole to be tapped. The rapid retraction becomes effective the instant the tap leaves the work. The tap is removed at twice the tapping speed. As high as 2,000 holes per hr. can be tapped.

Infinite speed is possible within



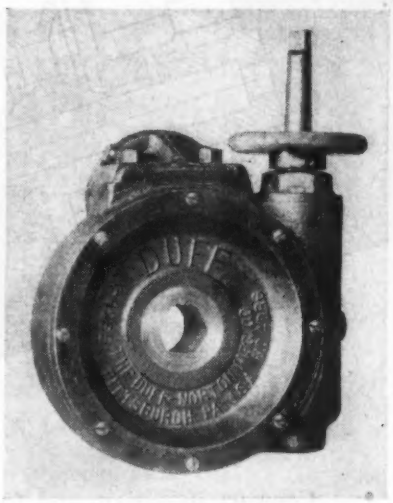
Cleveland tapping machine

the range from 40 to 400 r.p.m., but higher ranges can be supplied. The machine has a tapping capacity from ⅜ to 3 in. in steel and will tap Class 3 fits on a production basis, either right or left hand thread. Depth control can be set from 1 to 6 in.

Jacks are Motorized Easily With Duff-Norton Attachments

Manually operated jacks can be converted for motor operation by means of Duff-Norton attachments, according to the Duff-Norton Manufacturing Co., Pittsburgh 30, Pa., making it possible to use portable shop motors of 1½ to 2 in. drill size to power them.

The No. 4085 Duff attachent is designed for use with Duff-Norton Governor-Controlled jacks, and may



Duff motor attachment for jacks

be attached or removed as desired. The No. 4086 is a permanent model, bolted to the jack.

The Norton motor attachment, No. 571-MA, is used with Duff-Norton Self - Lowering Speed-Controlled jacks, and is quickly slipped on the jack pinion shaft after removal of the ratchet case and gear.

Black Drill Announces Line Of Hardsteel Tool Tips

Black Drill Co., Division of Black Industries, Cleveland, Ohio, is now supplying a line of tool tips made of "Hardsteel" and designed for brazing into steel shanks.

Tools tipped with "Hardsteel" are said to be more economical in first cost and more easily and quickly reground on a standard wheel one or two grades softer than is necessary for high speed steel. They are further described as being easy to braze, while permitting the making of tools that combine a strong tough shank with a cutting edge having the abrasion resisting qualities of the sintered carbides plus the shock resisting qualities of high speed steel.

Specially-Prepared Switch Copper by REVERE

Revere has developed a new method of manufacturing Switch Copper to meet the exacting requirements of the electrical industry on an economical basis.

The process produces Switch Copper with a surface finish far superior to regular commercial bar copper, and with exceedingly close tolerances. Flatness measured across the width of the bar is kept to the following Revere standards: — Convexity none. Concavity, .001″ maximum per side up to 2″ wide, .002″ per side, 2″ and over. Camber, or depth of lengthwise arc 1/8″ maximum in 8 feet. Edges are full rounded, square or as specified. Made from electrolytic copper, meeting the A.S.T.M. specifications for purity and conductivity.

This is really beautiful metal. Its superior finish and flatness mean that simple cutting and drilling are enough to produce switch blades that will make perfect contact, reducing current losses. Naturally, Revere Specially-Prepared Switch Copper carries a slight premium in price, but those who have used it report this is insignificant compared with the large savings made possible by abandoning the expensive finishing processes required when using ordinary commercial bar. Revere Switch Copper is also being used in: knife-blade fuses; switchboards; in other equipment requiring exposed bus bars. For further information, write Revere Executive Offices.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York 17, N. Y.

Parts and Materials

Oil-Rite Announces Style B Constant-Level Oiler

Oil-Rite Corp., 3482 S. 13 St., Milwaukee 7, Wis., announces its Style B constant-level oiler with a base that has bottom and side outlets, either or both of which can be used for bearing feed. Large air vents

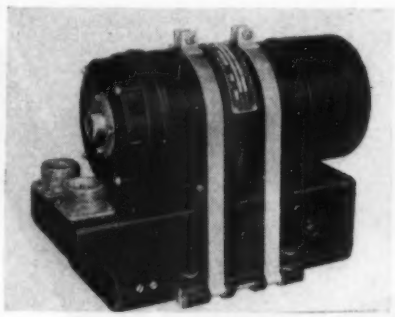
Oil-Rite Style B oiler

can be connected to a filter or to a breather tube on the bearing. Oil level is clearly marked on the outside.

Large passages for oil and air permit easy flow of lubricant. These lubricators are available in 1, 2, 4, 8 and 16 oz. capacities.

Eclipse-Pioneer Motor-Generator Powers Aircraft a.c. Systems

Type 800 motor-generator announced by Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., is designed to operate from aircraft d.c. electrical system and to provide 800-cycle constant-frequency a.c., independent of engine-driven generators, for radio equipment and other a.c. accessories.



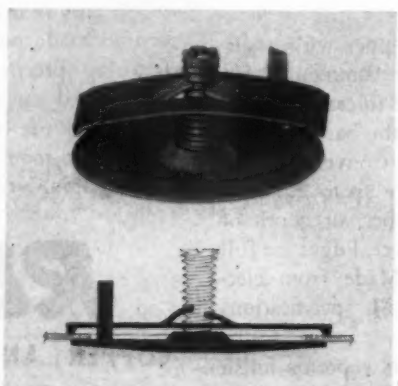
Eclipse-Pioneer motor-generator

Operation of the motor-generator is automatic when the remote-control switch is closed.

An integral carbon-pile voltage regulator maintains a constant a.c. supply of 115 v. over the rated operating range of the motor-generator. Dimensions are 11-13/16- × 8-19/32 × 5½ in. Weight is 24.5 lb.

Tinnerman Speed Nut Cover Plates Attached from One Side

Speed Nut Cover Plates, industrially applicable in removable covers for inspection doors, access holes and vents, are manufactured by Tinnerman Products, Inc., 2113 Fulton Rd., Cleveland 13, Ohio. They are also used to seal up holes left after alteration or removal of equipment. They are easily installed from one side and as simply removed. Three sizes are now available to fit a wide range of panel thicknesses and to cover holes 29/32, 1⅛ and 1⅜ in. dia.



Speed Nut cover plates

Turco Blackening Process Gives Ferrous Parts a Durable Finish

Ferrotoning, a chemical blackening finish for ferrous parts, developed by Turco Products, Inc., 6135 South Central Ave., Los Angeles 1, Calif., utilizes simple immersion equipment. The finish is gleaming black or rich matte, integral with the metal itself and extremely durable. It does not chip, flake or peal off even under repeated flexing. It will not blister and cannot be removed under routine cleaning operations by the action of solvents of degreasing agents.

The process is completed by finishing the Ferrotoned surface with non-drying petroleum oils, rust inhibiting lacquer or a synthetic resin coating.

Marman Universal Stainless Steel Hose Clamp Now Ready

A new stainless steel flexible-band type hose clamp, Universal, series 820, designed for aircraft use is announced by Marman Products Co., 940 W. Redondo Blvd., Inglewood, Calif. Special construction features include a patented swivel - action nut which rocks on swivel pins and tips down when the thumb screw is tightened. This clinches the band, prevents slipping and gives an unusual high back-off torque. The flexible band conforms to the shape of any clamping surface and does not pinch. Various sizes of clamps fit hoses from 11/16 in. O.D. to 3 9/16 in. O.D.

Marman Universal clamp

Turbo Glass Sleeving Flexible, And Non-Moisture Absorbing

William Brand & Co., 276 Fourth Ave., New York 10, N. Y., announces Turbo single saturated glass sleeving, said to have greater flexibility than has heretofore been associated with electrical insulation of

WHAT IS
"Plunge Forming" or Crush Dressing
OF GRINDING WHEELS?

Is Crush Dressing New?

Yes and no—it is relatively new "over here" for general commercial use, but it has been standard practice in other countries for some time.

Who Introduced It Commercially to the U. S. A.?

Knowing of this practice, representatives of the Sheffield Corporation, Dayton, Ohio, visited England in 1939 to investigate crush dressing. So impressed was Sheffield with the possibilities that patent and manufacturing rights were obtained for producing this equipment in America. A few weeks later an English concern placed an order with Sheffield for a large number of thread grinders especially designed for the crush method of wheel dressing.

What was the First Commercial Machine to be Produced in the U. S. A. Using Crushed Wheel Dressing?

The Precision Thread and Form Grinder was designed, manufactured, and sold by The Sheffield Corporation of Dayton, builders of gage thread grinders for thread gage production since the first World War. This new machine tool is equally proficient in producing precision threads or forms (regular and irregular) from a crush dressed wheel.

What is Crush Dressing?

Crush dressing is the process of using hardened steel rolls to form or dress grinding wheels to a wide variety of shapes which in turn can be transferred to the work part.

How is the Crusher Roll Produced?

The same form that is to be crushed into the wheel is ground into a hardened steel roll approximately three inches in diameter by the use of the Sheffield Micro-Form Grinder. The profile is reproduced directly from a drawing. A pantograph positions a microscope to guide the operator in feeding the grinding wheel into the steel roll to an accuracy of .0003".

Original crusher rolls for threaded parts are produced on the Sheffield Precision Thread and Form Grinder by using a single point wheel.

Many additional crusher rolls for either forms or threads can be reproduced quickly and at minimum cost by using crush dressed wheels on the Sheffield Thread and Form Grinder.

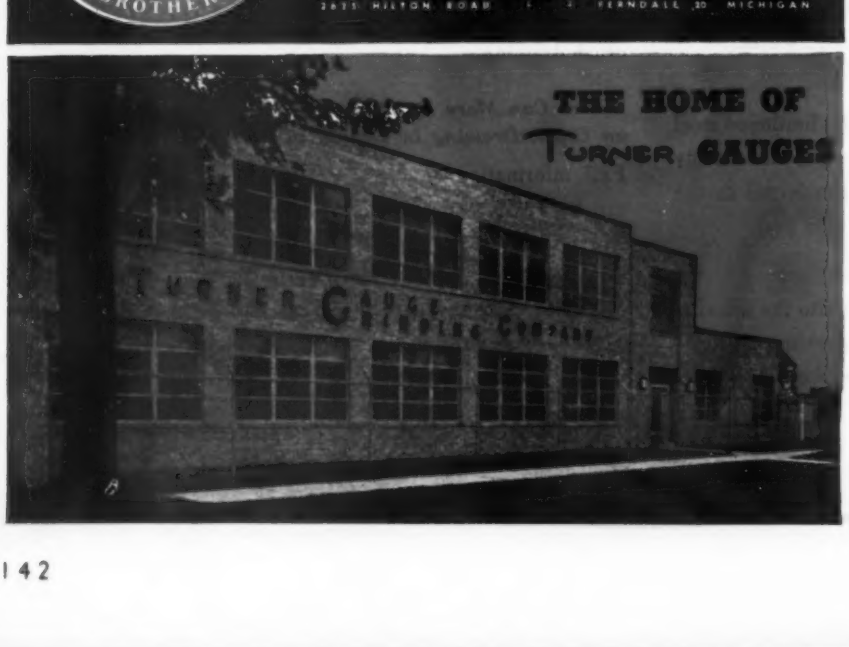
Can the Wheels of Surface Grinders be Crushed Dressed?

Yes, they can. At the same time the Sheffield Corporation pioneered the commercial use of crush dressing for producing circular forms and threads, it also pioneered the use of this method for dressing surface grinder wheels and the development of standard mountings for crusher rolls on surface grinders. Sheffield has unmatched research and commercial experience in crush dressing for surface grinding and has counselled with many plants making critical war materials on the solution of production problems by crush dressing.

Where Can More Detailed Information on Crush Dressing be Obtained?

Full information on crush dressing, production of crusher rolls for surface grinders, the Precision Thread and Form Grinder especially developed for crush dressing, and the Micro-Form Grinder for producing crusher rolls, can be obtained from The Sheffield Corporation, Dayton 1, Ohio, U.S.A. Engineering data will be forwarded promptly.

ADVERTISEMENT OF THE SHEFFIELD CORPORATION

Fast
Delivery
We are now offering fast delivery service on all TURNER standard plug gauges and Plast-O-Lock collet type plug gauges. TURNER also makes cylindrical ring gauges, special flush pin gauges, solid type snap gauges, master discs, and built-up gauges. Write today for up-to-the-minute information.
TURNER BROTHERS
TURNER GAUGE GRINDING COMPANY
3875 HILTON ROAD FERNDALE 20 MICHIGAN


this type. It is non-moisture absorbing, non-burning and will not fray, split or crack. Any color can be supplied and all are vivid and permanent.

This glass tubing is said to provide faster, easier assembly and to facilitate application by its ready color identification. It can be supplied in any diameter.

P. & N. Groups Aircraft Junction Boxes into Line

More than 200 aircraft junction box assemblies, ranging in size from 1⅞ × 1⅞ in. to 23 × 15 in. have been grouped into a standard line by Poulson & Nardon, Inc., Los Angeles, Calif. Material thicknesses are from 0.032 to 0.064 in. in 2SO or 3SO aluminum. Covers to fit are supplied in 3S½H aluminum. Boxes and covers can be supplied with conventional nut plate and screw-type fasteners or other types of fasteners.

Flame-Resistant Chromate Gaskets by Sherwin-Williams

A gasket of a felt base, impregnated with a chromate pigmented compound which renders the material flame and fire-resistant as well as corrosion resistant is announced by The Sherwin-Williams Co., Cleveland, Ohio.

Chromate gasketing is described as able to withstand relatively prolonged exposure to salt water without decomposition. According to the manufacturer, it will maintain air pressures up to 25 psi. at normal temperatures, is not affected by fuels and has definite rust inhibiting properties. It may be had in 1/8 or 1/16 in. thickness, either factory pre-cut or cut from sheet at the point of use without special tools.

Chace Announces Corrosion Resistant Manganese Alloy

Exceptional uniformity in response to heat-treatment is claimed for No. 720 manganese alloy, a precipitation hardening alloy consisting of 60 percent copper, 20 percent nickel and 20 percent manganese. It is available from W. M. Chace Co., 1607 Beard Ave., Detroit 9, Mich. The alloy is a soft, ductile metal which can be either hot or cold formed into intricate shapes and then hardened by a comparatively low-temperature aging treatment to 400 Vickers or more. It has much the same corrosion resistance of the cupronickels.

Tensile strength is 200,000 psi.; yield stress for 0.1 percent offset is 170,000 psi. High freedom from "drift" and high fatigue strength

make the alloy useful as a spring material. Aging temperature is 750 F., ± 100 F., and varying degrees of hardness are produced by varying the time at this temperature.

The deep-drawing characteristics and the work-hardening rate of the alloy indicate it may be used for corrugated diaphragms, bourdon tubing and temperature—or pressure—responsive bellows.

TRADE PUBLICATIONS

Aircraft Screw Products—The Aircraft Screw Products Co., Inc., 47-23 35th St., Long Island City 1, N. Y., has issued two booklets, Nos. 240 and 260 on "Heli-Coil" insert kits.

Brazing Alloy—Bulletin 11-A issued by Handy & Harmon, 82 Fulton St., New York 7, N. Y., describes silver alloy wire and strip for brazing cemented carbide tips on tools.

Broaches and Broaching—A 108-page brochure issued by The Lapointe Machine Tool Co., Hudson, Mass. Edition limited. Request on company letterhead.

Broach Sharpeners—Eight-page illustrated bulletin No. CS2-44, describing sharpeners for round and flat broaches up to seven feet long, has been issued by the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich.

Burr Removal—A report on "Removing Burrs With Power Brushes," obtainable from the Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio, shows methods, fixtures and typical brushing applications.

Corrosion—A 54-page booklet "Corrosion," issued by the International Nickel Co., 67 Wall St., New York 5, N. Y., contains a comprehensive analysis of corrosion processes, factors and testing, which is available to metal users, designers and engineers.

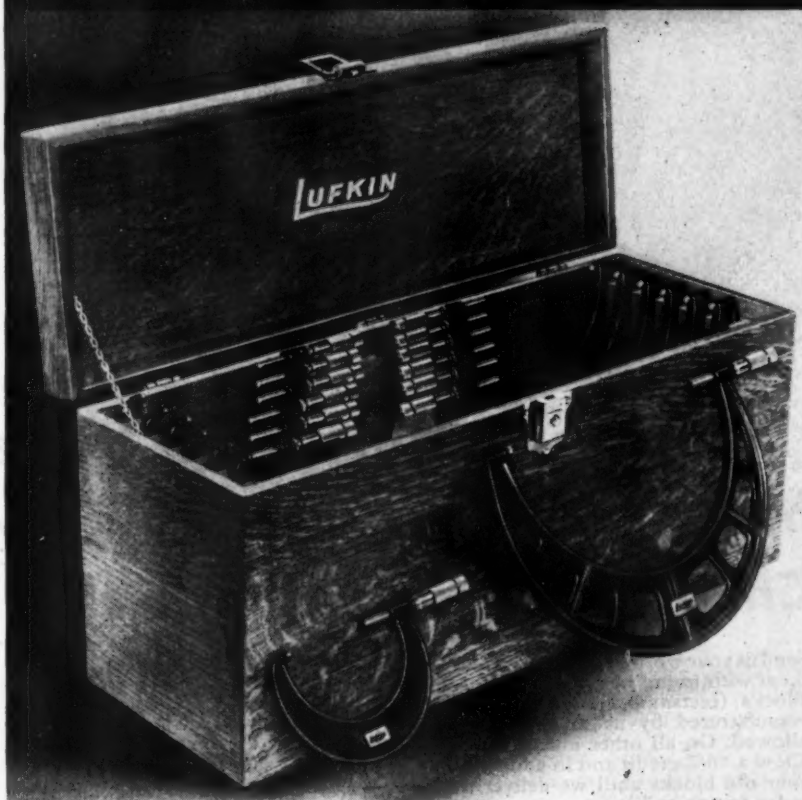
Decimal Equivalent Chart—Copies of the chart may be obtained from Dayton Rogers Mfg. Co., 2835 Twelfth Ave. South, Minneapolis 7, Minn., if requested on a company letterhead.

Floor Machine—Bulletin issued by the G. H. Tennant Co., 2530 Second St. North, Minneapolis 11, Minn., on the Model K wire brush type industrial floor machine.

Flow Chart Calculator—Designers for Industry, Inc., 2915 Detroit Ave., Cleveland, Ohio, has available a flow chart for calculating date of completion of any project from any starting date, based on a given number of

LUFKIN

MICROMETER CALIPER SETS



Every well equipped plant tool room needs at least one set of Lufkin Micrometers for busy tool and diemakers who require an extensive range of "mikes" handy for immediate use. These heavy, enameled, ribbed frame "mikes" are fitted neatly into a solidly constructed oak case with sturdy lock. Available in sets from 0 to 12 inch—and each made to the exacting Lufkin standards of quality and precision.

Buy the best—buy Lufkin. Write for free catalog.

ARMY (E) NAVY

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TAPES · RULES · PRECISION TOOLS

Start your New Year Right...

2 to 3 weeks delivery.

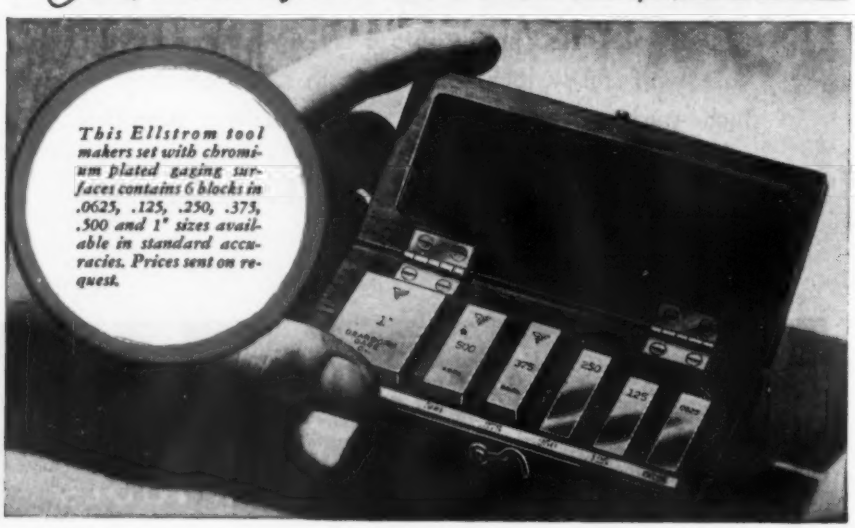
..trade in your worn gage blocks on new ELLSTROM Chromium Plated Blocks..

Send us your worn gage blocks and we will replace them with brand new *Ellstrom* Chromium Plated Blocks (rectangular). On the blocks originally manufactured by us a credit of 20% will be allowed. On all other makes of gage blocks we allow a 10% credit and in addition you may keep your old blocks until we deliver the new. Write today for price list.

SAVE UP TO 20%

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks


This Ellstrom tool makers set with chromium plated gaging surfaces contains 6 blocks in .0625, .125, .250, .373, .500 and 1" sizes available in standard accuracies. Prices sent on request.

days allowed for various steps for the completed project.

Gages and Indicators—Catalog No. 53, available from B. C. Ames Co., Waltham, Mass., contains information on gages and dial indicators for measuring, size control and general testing.

High Speed Hand Tool—"More Power to You," a booklet issued by Precise Products Co., Racine, Wis., describes a small high-speed electric hand tool used for grinding and other purposes on steel, non-ferrous metals, plastics and other materials.

Hydraulic Presses — Bulletin No. VLI-44 on hydraulic straightening presses is available from Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich., and describes models designed for rough and finished work.

Hydraulic Pumps—Bulletin No. 138 of the Lyon-Raymond Corp., 1912 Madison Street, Greene, N. Y., contains specifications of foot- and hand-operated hydraulic pumps.

Leather Belting—A 56-page booklet by the Graton & Knight Co., 356 Franklin St., Worcester 4, Mass., which has data, charts, and specifications and which covers the selection of belting and applications and a catalog section of accessories.

Lubrication Manual—The eighth edition of "Panorama of Lubrication," on the solution of lubrication problems of aircraft engines, has been published by the Shell Oil Co., 50 West 50th St., New York 20, N. Y.

Multiple V-Belt Drives—A booklet citing the advantages of these drives is available from the Multiple V-Belt Drive Association, 140 So. Dearborn St., Chicago, Ill.

Oil Purifier—The first issue of "Clean Oil," a company publication of the Honan-Crane Corp., of Lebanon, Ind., is available. It covers developments in the field of oil purification.

Pneumatic Saw—Bulletin No. 95-S of the Cleveland Pneumatic Tool Co., 3781 East 77th St., Cleveland 5, Ohio, gives details of a "baby" saw for ripping sheet metal up to 3/16 in. thick.

Scientific Testing—A booklet of Triplett & Barton, Inc., Burbank, Calif., contains comprehensive data on prefabrication, metallurgical, X-ray and other scientific testing. Request on company letterhead.

Screw Thread Fits—A 40-page booklet, "Guide to Screw Thread Fits," obtainable from the Greenfield Tap and Die Corp., Greenfield, Mass., gives detailed tables on tap and product tolerances.

HYDRAULIC BALANCE

CANCELS OUT BEARING LOADS

And Means MUCH LONGER PUMP LIFE

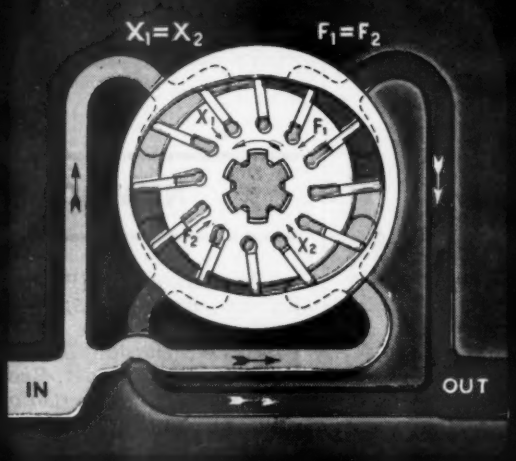
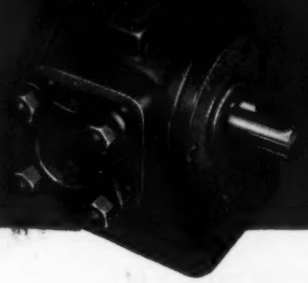


Diagram showing patented "Hydraulic Balance" construction.

VICKERS

Balanced

VANE TYPE PUMPS



As illustrated by the diagram above, equal and opposing pressure areas are provided on the outlet side and on the inlet side of Vickers Balanced Vane Type Pumps. The equal and opposing radial hydraulic thrust loads cancel each other . . . consequently there are *no* bearing loads resulting from pressure. The major cause for wear is thus completely eliminated and the result is much longer pump life. This "Hydraulic Balance" construction is exclusive with Vickers Vane Type Pumps; it also permits an unusual design compactness and is an important reason for the exceptionally high efficiency of these pumps.

Vickers Balanced Vane Type Pumps are available in single-stage for 1000 psi (see Bulletin 40-25a); two-stage for 2000 psi (see Bulletin 40-16) and also two-pressure, large-small volume (see Bulletin 38-14). Vickers Application Engineers will gladly discuss with you the many different types of hydraulic power and control circuits on which these pumps have improved machine performance. Write the office nearest you.

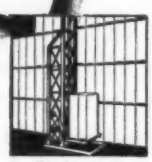
VICKERS *Incorporated* • **1410 OAKMAN BLVD. • DETROIT 32, MICHIGAN**

Application Engineering Offices: CHICAGO · CLEVELAND · DETROIT · LOS ANGELES · NEWARK · PHILADELPHIA · ROCHESTER · ROCKFORD · TULSA · WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

Bucket brigade methods of handling are far too costly in time and manpower. Stack and pile with this new low-cost machine. Loads, unloads, handles, elevates, stacks cartons, cases, boxes, bags, other packages. Compact, lightweight, safe, easy to operate, flexible. Easily wheeled into crowded corners, around the shipping platform—fine for truck loading and unloading. Adjustable boom is clear of supporting obstructions; easily extended over piles or into car or truck. Machine held in position by floor locks on base. Reversible carrying apron. Available in four sizes, high end adjustable up to 7½, 8½, 9½ and, 10½ feet; stacks commodities as high as 14 feet. Handles individual items up to 100 lbs. Motor mechanism in base frame — plug into any convenient outlet. Write for Bulletin No. 11-AM-25.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul 9, Minn.
Sales and Service in Principal Cities


Tiering and Lifting Machines

Portable Conveyors and Pilers

Spiral Chutes

Pneumatic Tube Systems

Tubing Parts—A brochure on Wolverine tubing parts is obtainable from the Calumet and Hecla Consolidated Copper Co., Detroit 9, Mich. Covers fabricated tubular parts of copper, brass and aluminum.

Valve Catalog—The A. W. Cash Valve Mfg. Co., Decatur, Ill., has available a 28-page catalog with detailed information on automatic valves and pressure controls for use with details of component sections.

Vertical Boring Mills—Bulletin No. 176, obtainable from the Cincinnati Planer Co., Cincinnati 9, Ohio, covers vertical boring and turning mills, and reviews their component members.

Welding — A glossary of foreign welding terms, published by the American Welding Society, 33 W. 39 St., New York 18, N. Y., supplements standard or engineering dictionaries. Price, 50 cents.

NEW BOOKS

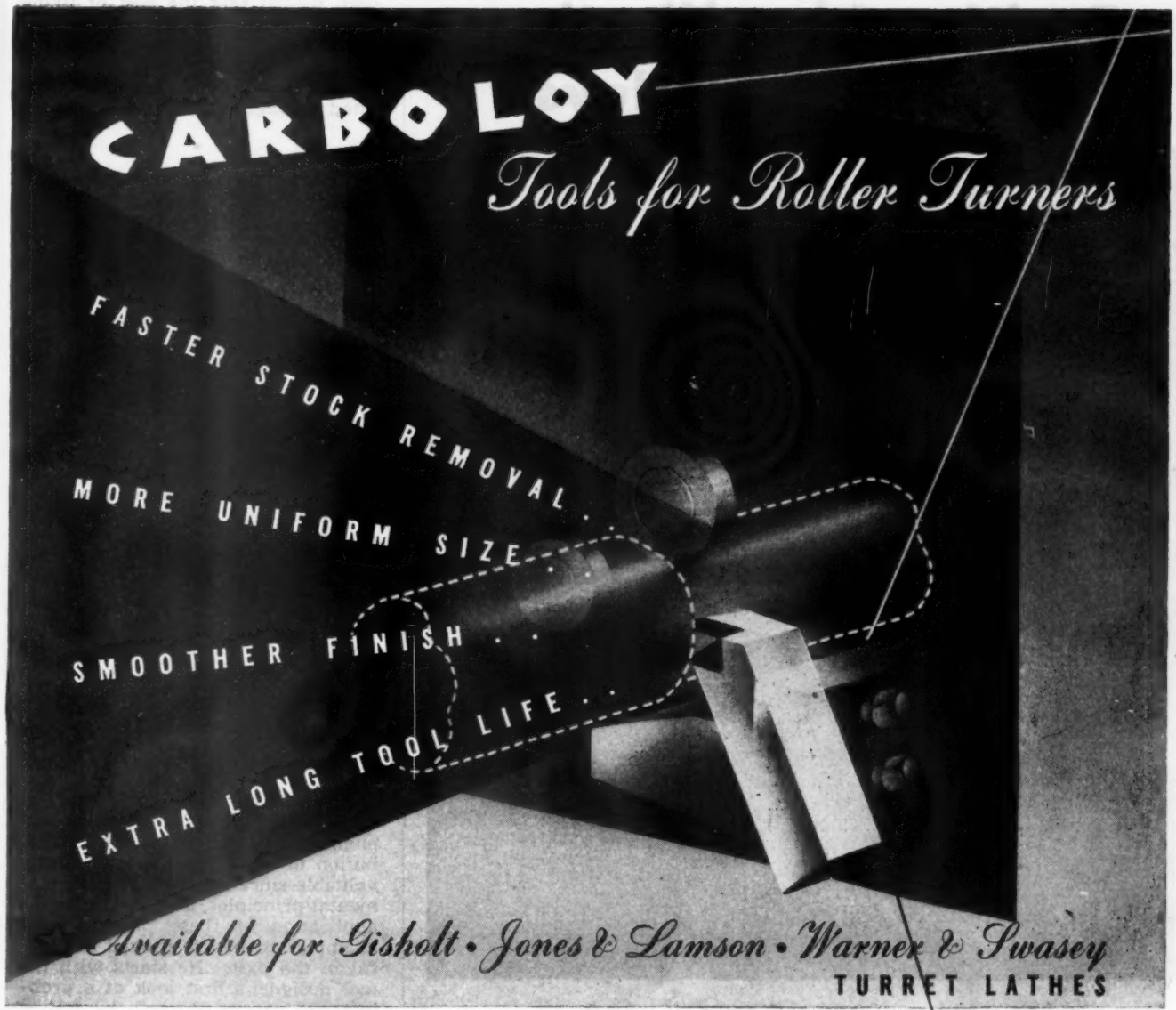
THE THEORY AND PRACTICE OF JOB RATING—*By M. F. Stigers, associate professor of trades and industrial education, Purdue University, and E. G. Reed, president, Reed Laboratories, Inc., Akron, Ohio. Second Edition. Published by McGraw-Hill Book Company, 330 West 42 Street, New York 18, N. Y.* $1.75.

Since the publication of the first edition of their book two years ago, the authors have improved their plan of job rating on the basis of a point system. In this edition, comparison is made between this system and the ranking system, the classification method and the factor-comparison plan, with the failings of the three latter systems explained. The point system is explained by actual case discussions of rate-setting for several different occupations. Points are assigned for such qualifications of workers as strength, energy, skill, responsibility, judgment, analysis, adaptability, initiative, and accuracy. Then methods for transforming such point totals into wages for the work are explained.

The authors point out the unfortunate fact that many wage rates have been the result of arbitrary decisions by either management or labor, or both. They feel this task should be entrusted to skilled men in the same way as other sciences are treated, but that labor should have the right to question the rates established. It is contended that if wage rates are set only at the cost of living, then the standard of living is pegged at one point. In fact, such elements as labor efficiency, climate, living conditions, types of people, customs and laws may carry

CARBOLOY

Tools for Roller Turners



Available for Gisholt • Jones & Lamson • Warner & Swasey
TURRET LATHES

When machining bar stock with roller turners, you'll step up output and step down costs with Carboloy Roller Turner Tools.

Designed for extra long tool life and rapid regrinding, Carboloy Roller Turner Tools remove stock faster, hold more uniform size, and produce a better finish.

Carried in stock ready for prompt deliveries. Standard styles for Gisholt, Jones & Lamson, and Warner & Swasey Turret Lathes. For top production, and maximum economy, put Carboloy Roller Turner Tools on your jobs. Write for catalog GT-175R.

STANDARD CARBOLOY TRADE MARK TOOLS

CARBOLOY COMPANY INC. • 11149 E. 8 MILE BLVD. • DETROIT 32, MICHIGAN

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Positive Identification for Ryerson Alloys

Confirms Quality...Prevents Shop Errors

Immediate Shipment from Stock

Each bar of alloy steel in Ryerson stock is painted on the end to indicate the type of alloy—then stamped on the side near the end with the number of the heat from which the bar was rolled. Smaller size bars are bundled and tagged with similar identification.

This is important because it offers you an unmistakable means of verifying the analysis of the alloy steel you receive from Ryerson. Heat number and color marking are also recorded on the Ryerson Alloy Steel Report that is furnished with each alloy shipment. This Report contains accurate data on the analysis, working temperatures and heat treatment response for quenched and drawn 1, 2, 3 and 4 inch rounds of your steel. This gives you reliable information for heat treatment that will produce the desired result.

The unique and valuable Ryerson alloy service is one of many reasons why it will pay you to concentrate your steel purchases with us.

Joseph T. Ryerson & Son, Inc., Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Pittsburgh, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE

such weight that the cost of living has no measurable effect. The book has many provocative ideas and should prove helpful to both management and labor experts interested in wage rates.

•

POSTWAR NATIONAL INCOME—*By Joseph Mayer, Published by The Brookings Institution, Washington 6, D.C. 50 cents.*

Both government expenditures and tax policies are vitally related to national income; and business plans for production and expansion are directly affected by expectations with respect to the probable volume of national purchasing power.

This analysis of the probable magnitude of the postwar national income seeks both to clarify the concept of national income and what should properly be included, and to determine as accurately as possible the probable level in the first reasonably settled postwar year.

•

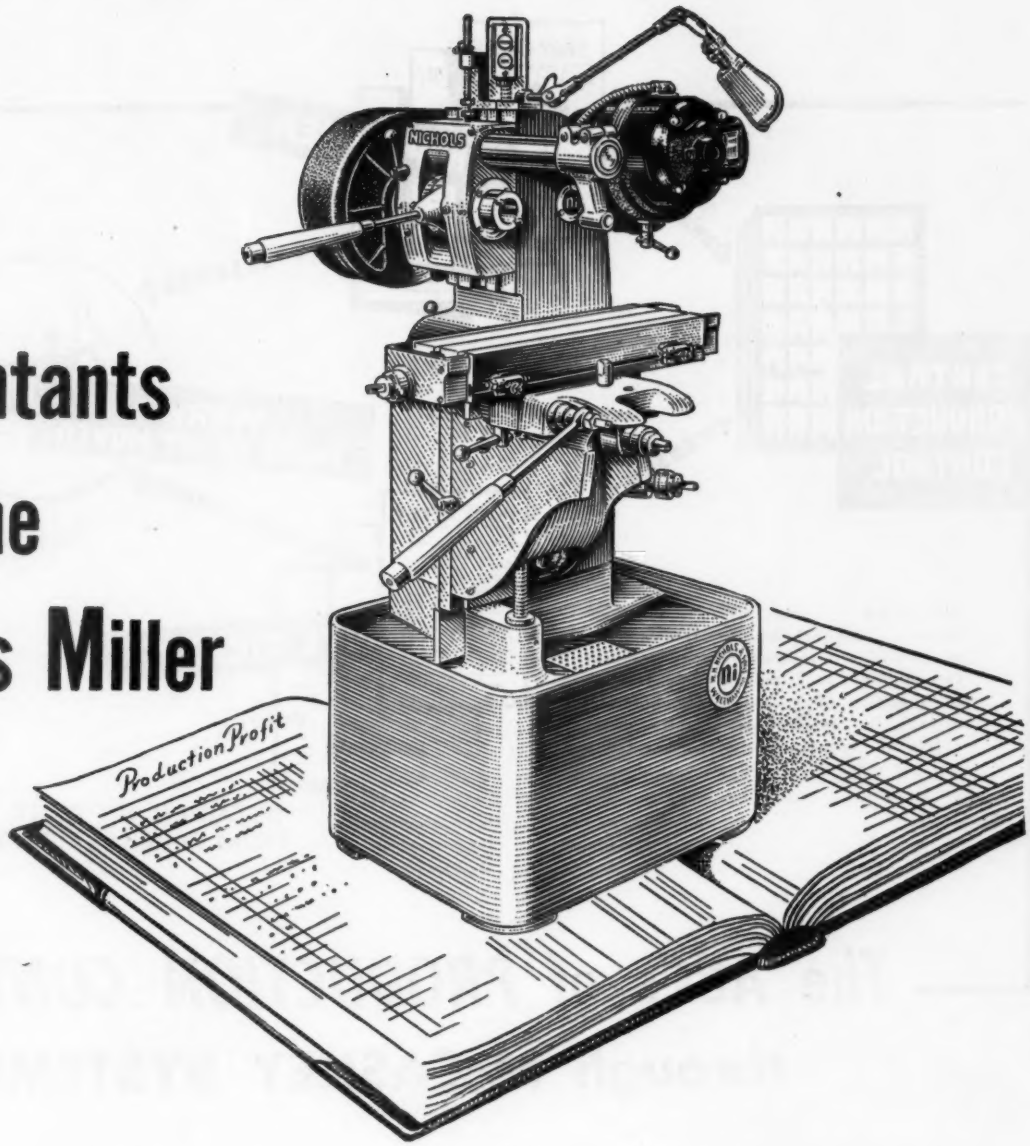
ANALYSIS OF DRILL JIG DESIGN—*By J. I. Karash, Plant Engineer, Reliance Electric & Engineering Co. 330 pages. Published by the McGraw-Hill Book Co., 330 West 42 St., New York 18, N. Y. $2.*

It seems to be impossible to get too much sound information on tool engineering. Mr. Karash's contribution to the subject is particularly valuable since he starts with fundamental principles, and illustrates the application of these principles by examples that have proved successful in the past. He starts with the tool designer's first look at a problem and carries through by telling of the various steps that must be taken in order to produce a workable, well-balanced drill jig. He describes the functions of a jig and its inherent advantages and disadvantages. Then he analyzes the method of gathering information from which a plan of procedure can be formulated.

Mr. Karash clarifies the subject by outlining in chronological order the decisions which must be made to proceed logically in the development of the jig. Such decisions include division of work, type of machine, principles of locating and clamping. Other topics discussed by the author are secondary operation jigs, positioning, chip control and the principles of interchangeability.

Not least in importance is the consideration given the subject of justification. It is just as important for a tool designer to have a clear idea of the cost of the jig in relation to the manufacturing savings involved as it is for him to develop a workmanlike design. The common sense approach to the subject taken in this volume makes it required reading for students and tool engineers.

Why Accountants Like the Nichols Miller



He may not know a milling machine from a centerless grinder. But your accountant, because he keeps a watchful eye on the profit side of your production ledger, can appreciate the advantages of a machine that *quickly pays for itself*... the Nichols Miller.

Extra-utility is basic in the Nichols Miller's design. Starting with the fundamental principle of bringing the cutter on a sliding head down to the work, W. H. Nichols & Sons has engineered around it a machine tool that maintains *toolroom tolerances* in high-speed production, yet is sturdy enough to take on heavy duty jobs as well.

Simple, inexpensive fixtures and quick set-up keep Nichols Millers humming even in semi-skilled hands, through an extensive range of milling, boring, turning and facing operations. And it's not unusual to see it doing the work of expensive precision boring machines, lathes and grinders... more economically.

Lathe carriage flexibility is an added production feature made possible by the Lever-Rack and Pinion Transverse feed, an exclusive Nichols development. Work can be chucked lathe-fashion on the spindle with tools mounted on table or vice-versa.

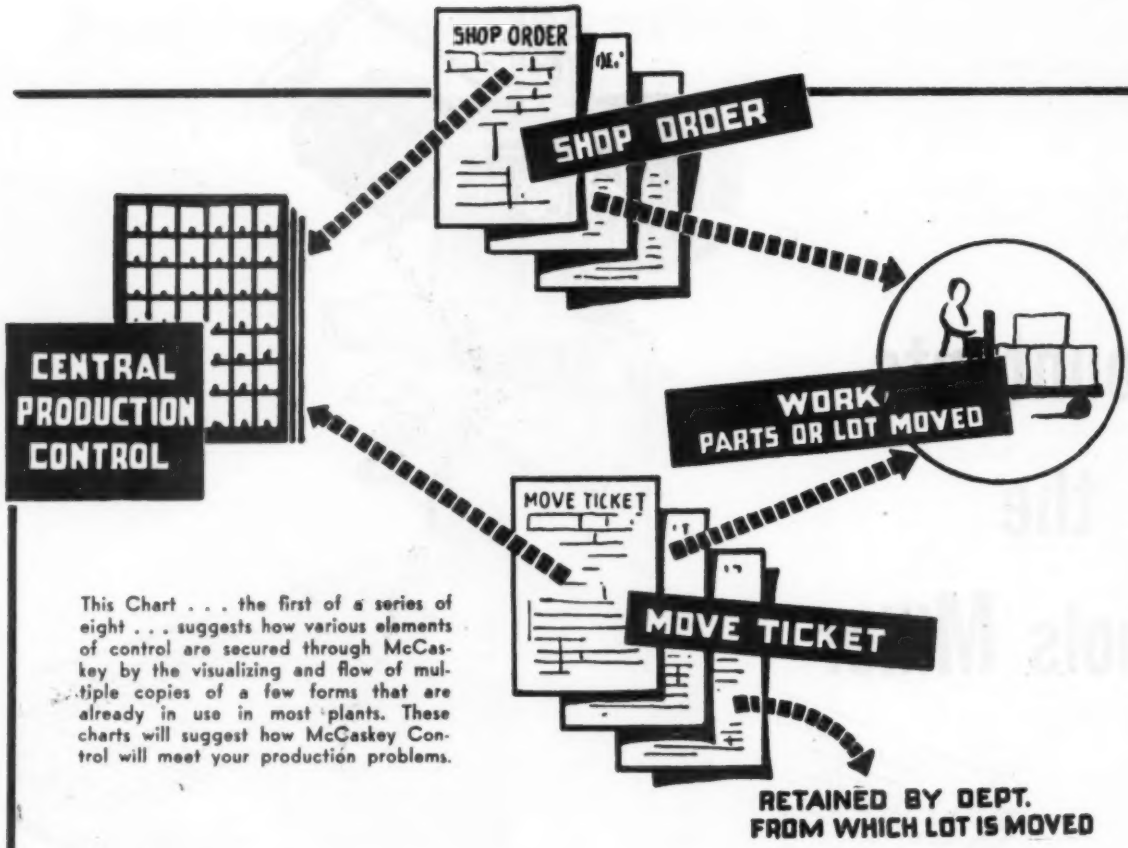
Equally at home in toolroom, laboratory or on the production line, the Nichols Miller is a profitable "operator." And you'll be surprised at its low initial and maintenance costs.

Our new photographic brochure will show you some of the many ways it can work for you. A post card will bring it to you promptly.

THE NICHOLS MILLER ni

"THE MILLER THAT USES ITS HEAD" • MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASS.

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 40 Church St., New York 7, N.Y. *Dealers in all principal cities*



This Chart . . . the first of a series of eight . . . suggests how various elements of control are secured through McCaskey by the visualizing and flow of multiple copies of a few forms that are already in use in most plants. These charts will suggest how McCaskey Control will meet your production problems.

The ABCs of PRODUCTION CONTROL through McCASKEY SYSTEMS

Lower costs for post-war production will result directly from sound planning, scheduling, routing, machine loading, dispatching and follow-up . . . from intelligent use of the right production control system for your particular requirements.

McCaskey Control gives you as much or as little data as you want or need. *Of greatest importance, however, the facts are secured and visualized by McCaskey with a minimum of forms and clerical work.* The control provided and the lower costs that result quickly and completely justify the expense of installation and operation.

SEND AT ONCE FOR

a copy of "The ABCs of Production Control," containing charts which cover a wide range of applications of control and which visualize simply and clearly how McCaskey Control operates. One of the systems shown or an adaption of it will fit your specific needs. WRITE FOR YOUR COPY TODAY.

A McCaskey industrial representative, qualified by training and experience, is available to help you analyze your requirements and suggest the McCaskey Control that will best meet them. No obligation, of course.

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McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

PURDY'S MOVING TO JERSEY

—To offer you more steels and faster deliveries

ANY PLANT in the Metropolitan New York area can get deliveries on a huge variety of steels — in one day — from Purdy's new warehouse at Lyndhurst, New Jersey. It's a 50,000 square footer, housing a much greater and more diversified inventory than before. And with a railroad siding that comes right into the building, plus the very latest handling equipment, steels are hustled in and out of our warehouse on the double, and sped to your plant over the fastest highways in these parts. Just look at how our new location cuts delivery time:

FOR PLANTS IN NEW YORK CITY... 15 minutes over express highways puts a Purdy truck in Midtown...20 minutes Downtown. That's faster than we made it from our New York warehouse!

FOR BRONX, WESTCHESTER AND CONNECTICUT PLANTS . . . a Purdy truck zips North on the Jersey side (no traffic lights), and hits the Bronx in far less time than formerly.

BROOKLYN, QUEENS AND LONG ISLAND . . . shooting across Canal Street or through the Queens tunnel, our trucks make the Island in under a half hour from Lyndhurst.

NORTH JERSEY PLANTS... We're just a jump away from you now.

And Purdy offers more than fast deliveries. Call on our sales engineers for help in cracking tough problems of application, methods — for using any part of the complete PLANET line in *ways that work.*

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INCORPORATED
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Lyndhurst, New Jersey

PLANET

COLD FINISHED STEELS
SPRING STEELS · TUBING
TOOL STEELS · DRILL ROD
COLD ROLLED STRIP STEEL

IT'S A PRODUCTION PLUSSER!

Time was when this manufacturer of magneto housings used slotted screws *and* helical inserts to fasten heads to withstand flight vibrations. Though expensive, this laborious, 2-step hand operation never produced completely vibrationless fastenings.

IT'S A COST REDUCER!

By switching to Phillips Recessed Head Screws, this manufacturer turned a slow-motion process into a fast, 1-step power operation, got a truly vibration-proof fastening. He also sliced fastening material costs about 71%, assembly costs correspondingly!

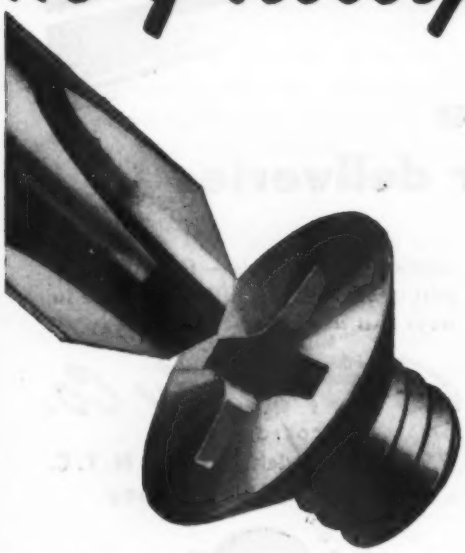
IT'S A STRENGTH BUILDER!

Besides being more efficient from assembly and cost angles, Phillips Screws are better from the design angle. Engineered to stand heaviest driving pressures, they take *any* load you need to impart product strength and rigidity.

IT'S AN ORDER GETTER!

From the sales angle, too, Phillips Screws are in a class by themselves. They snap up appearance of any product . . . make it stronger . . . and banish the burred screw heads that mar smooth surfaces, snag clothing, sabotage sales.

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

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These FREE-MACHINING MONELS

meet your need for strong, tough, rust-proof screw stock

"R" MONEL

...for parts not to be hardened by heat treatment

"R" Monel was developed several years ago as a "special" Monel to be used in making parts on high-speed automatic screw machines. Aside from its easy machinability, "R" Monel has practically the same composition, mechanical properties and corrosion resistance as *regular Monel.* Can be readily fabricated by cold forming. Strength equals that of the best steel screw stock.

"KR" MONEL

...for parts to be hardened by heat treatment

"KR" MONEL is the *machinable* brother of "K" Monel, long known for its great strength and hardness. It was specially developed for screw machine parts where a *heat-hardenable* material similar to "K" Monel is needed to withstand heavy loads. Corrosion resistant and non-magnetic, "KR" Monel can be made extra hard and strong through heat treatment after machining.

COLD-DRAWN OR HOT-ROLLED
ROUNDS • SQUARES • HEXAGONS

REMEMBER "R" MONEL AND "KR" MONEL —THEIR FREE-MACHINING QUALITIES CAN SAVE YOU TIME AND MONEY

MACHINING TECHNIQUES for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for your copy. Handy, too, is the reprint, "THE WORKING OF HIGH-NICKEL ALLOYS."

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Gentlemen: Please send me
- ☐ a copy of Machining Bulletin T-12
- ☐ a copy of "The Working of High-Nickel Alloys"

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(SEE PARTS BELOW)

Estimated Savings per Ton of Steel Used $139.00

SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

HIGH SPEED PRODUCTION

- Machined at 230 S.F.P.M.
- Increased Ductility
- Longer Tool Life
- Eliminated Annealing

BUY WAR BONDS

Ductility

SPRING RETAINER SCREW... The three pieces show production steps in making the oddly shaped finished part. 5/16" round *Speed Case* bar was machined at 230 s.f.p.m. to the ball end form, then cold forged to the disc shape with center projection; then the shank was cold bent. *Speed Case* is the only steel that would cold forge and still provide sufficient ductility in the projection to rivet, without intermediate annealing.

Our Metallurgists Are At Your Service.

Write for SPEED CASE CATALOG.

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HAMMOND · INDIANAPOLIS · CHICAGO
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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

IMMEDIATE DELIVERY

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No. by Gage	Length	Our Price Net Each
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21 to 30	5⅜	.75
31 to 40	5¼	.75
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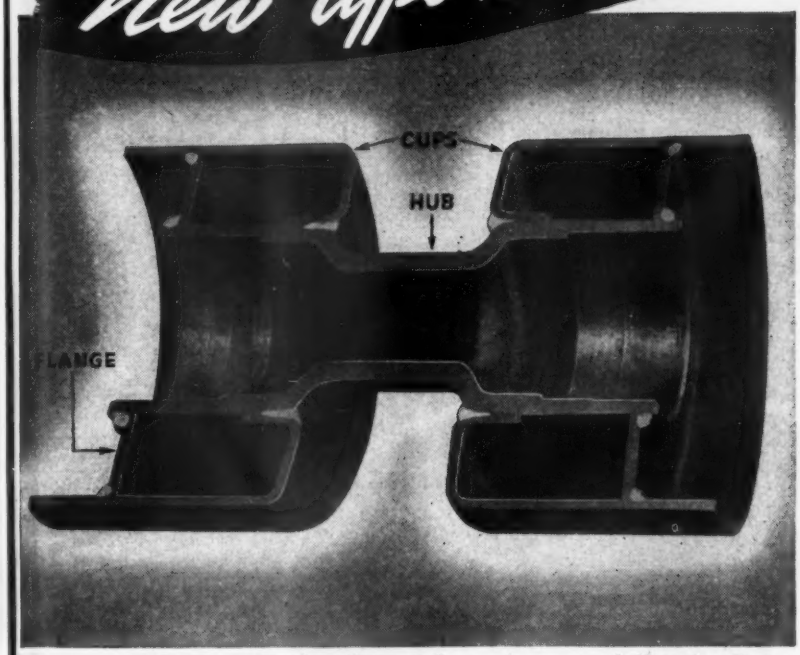
If you buy 60 drills or more — 20% discount

VICTOR
MACHINERY EXCHANGE INC.
251 CENTER STREET
NEW YORK N. Y.

New type roller designed with SEAMLESS STEEL TUBING



Cutaway section through top roller used on army half-tracks. Center-hub section is made from seamless steel tubing "spooled" to proper shape.

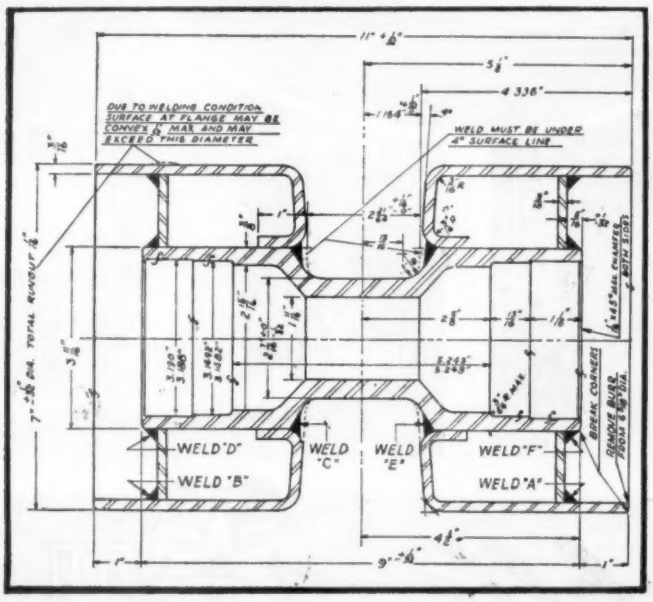

DUE TO WELDING CONDITION SURFACE AT FLANGE MAY BE CONVEX & MAY EXCEED THIS DIAMETER
WELD MUST BE UNDER 4" SURFACE LINE
WELD "D"
WELD "B"
WELD "C"
WELD "E"
WELD "F"
WELD "A"

Diagram of roller showing how flanges are fitted to tubular hub to make one piece unit.

Saves 38% in steel
Reduces rejects 100%
Cuts cost 39.1%

THIS "top" roller for half-tracks supports the continuous crawler tread as it returns along the upper portion of its travel. In former practice, out-of-balance rejects were running as high as 20% in regular production. Obviously something had to be done.

Careful study of the problem led to re-design of the unit. The new roller was made from Seamless Steel Tubing for the hub with rolled steel plates for cups and the closing end flanges (see diagram). These are assembled to form a one-piece unit by arc welding. Because all the processing operations involved lend themselves readily to handling on high production equipment, this roller is particularly suitable for manufacture by mass production methods.

38% Steel saved: Weight of the former design was 42 pounds with 14½ pounds machined away to give a finished weight of 27½ pounds. The weight of the new design before finishing is only 25½ pounds with *only* 1½ *pounds* machined away to obtain a finished weight of 24 pounds.

Rejects reduced 100%: Out-of-balance rejects formerly ran as high as 20% but not one unit has been rejected for this cause since it was re-designed.

Costs cut 39.1%: Costs have been reduced to $6.69 by the new method—a saving of $4.31 per unit.

This roller is just one of many war jobs that have been done better, faster, and at lower cost through the use of Seamless Steel Tubing.

When planning for peace products, plan to take advantage of cost-cutting methods made possible through SHELBY seamless steel tubing.

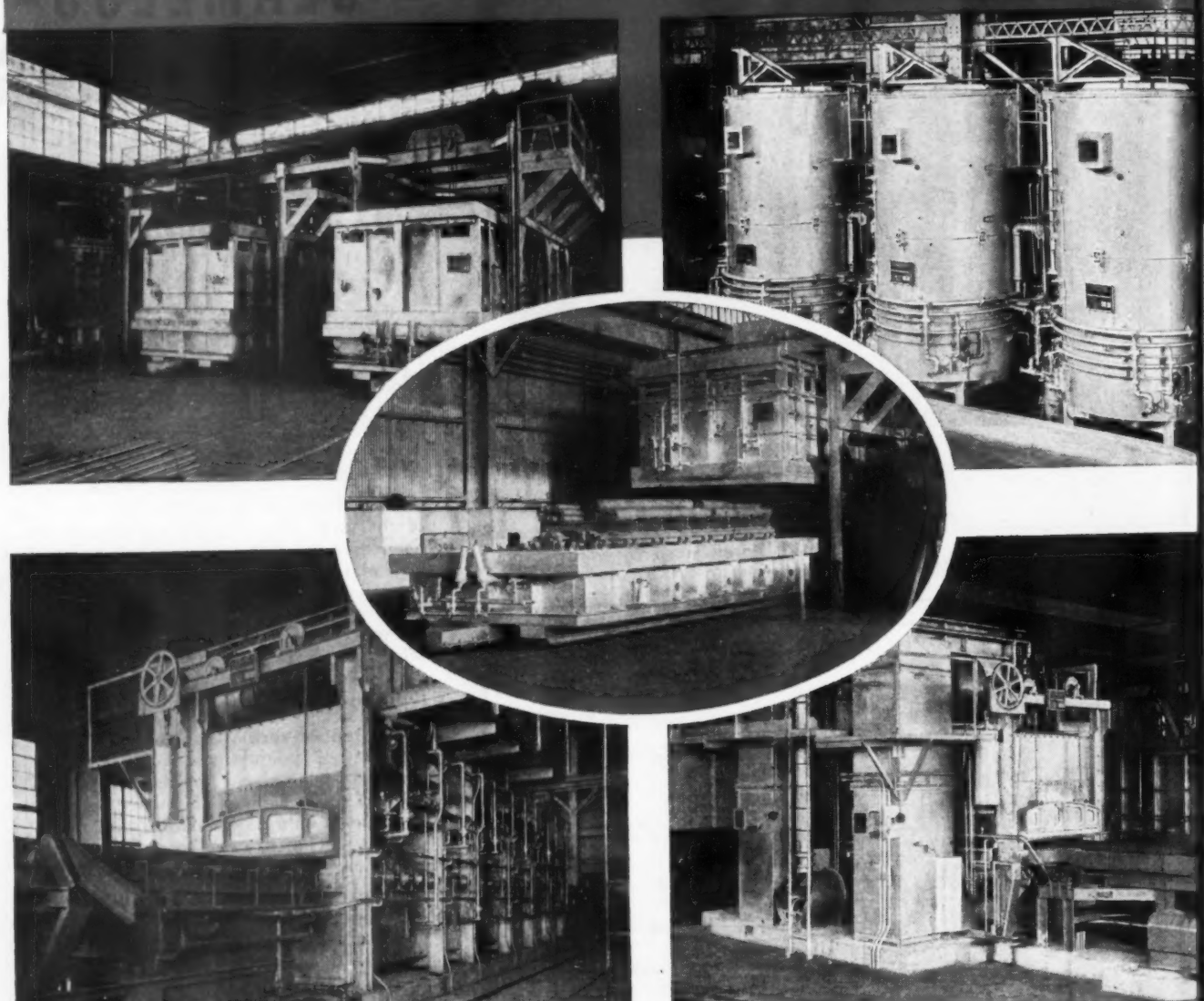
NATIONAL TUBE COMPANY
PITTSBURGH, PA.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

WALLS WITHOUT WELDS

UNITED STATES STEEL

Let Union Drawn



Republic
UNION COLD DRAWN STEELS

Free-Machining Bessemer, Open-Hearth and Electric Furnace Steels

Union Cold Drawn Special Sections

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting)

Show You How

TO ATTAIN THE PHYSICAL PROPERTIES —HARDNESS—MACHINABILITY

you desire in cold drawn steels . . . through furnace treatment

● If you have been using Republic Union Cold Drawn Steels, you are well aware of the uniformly higher physical properties, the greater hardness and the improved machinability which can be obtained from the cold drawing process.

And, if you have been using such steels when furnace treated, you readily can appreciate the improvement in physical properties and hardness made possible by heat treatment.

Machinability can be substantially improved, too, by furnace treatment, especially in the higher carbon types of steel and where unsymmetrical machining might result in warpage or distortion.

Through increases in the furnace capacity in all of its plants, Republic Union Drawn Steel Division now is ready to supply your every need in furnace treated cold drawn steels—annealed, normalized, spheroidized, stress relieved and otherwise heat treated.

The most modern pit-type recirculating furnaces provide for treatment of coiled stock. Types for the treatment of bars include both continuous roller hearth recirculating furnaces and car bottom furnaces heated by radiant tubes. Facilities also provide for furnace treatment in prepared atmosphere —thus preventing decarburization.

Union Drawn metallurgists are ready to sit down with you and discuss the benefits of furnace treated cold drawn steels as applied to your product. Their unusually wide experience qualifies them to recommend the most efficient and most economical grade of Union Cold Drawn Steel for each of your specific uses—and to show you how you can further benefit by having that steel furnace treated.

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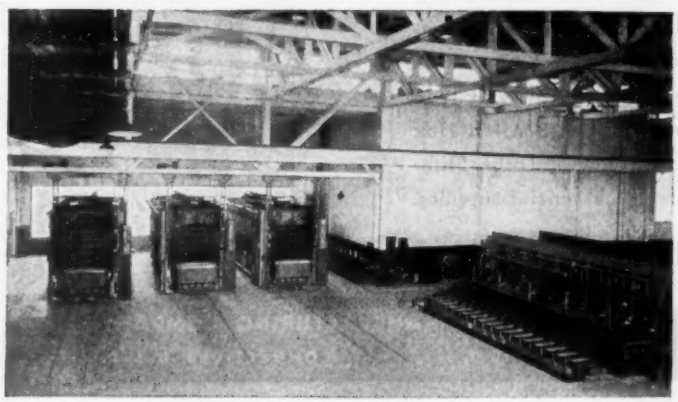


The photos on this and the opposite page show a few of the many modern furnaces installed in Republic Union Drawn plants in Massillon, Gary, Beaver Falls and Hartford since the beginning of the war.

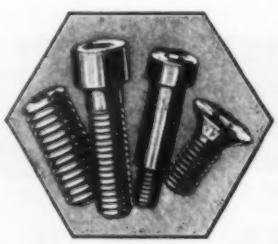
ALLEN Dowel Pins

"TRU-GROUND" for accurate locating of work: Ground to a limit of .0002" over basic size, with an allowable tolerance of plus or minus .0001".

"STEELED" to retain precision standards in die assemblies. Made of special-analysis ALLENOY steel, heat-treated to an extremely hard surface, with a core of the right hardness to resist any tendency to "mushroom" when driven into a tight hole.

Tensile strength: 240,000 to 250,000 lbs. per square inch. Here's the high safety factor in *holding-power* you always get for plus-measure in Allen products.

Ask your local ALLEN Distributor for samples and dimensional data . . . the same Distributor who serves you dependably with Allen Hex Socket Screws and other "life-lines" of essential supplies.



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ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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Available from Stock
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SCREWS and NUTS
Brass or Steel, Cut Thread
Class 3 Fit

Waltham is also equipped to furnish all types of
SPECIAL MACHINE SCREWS and SCREW MACHINE WORK
manufactured to special order.

Write for Catalog and Price List.

WALTHAM SCREW CO.
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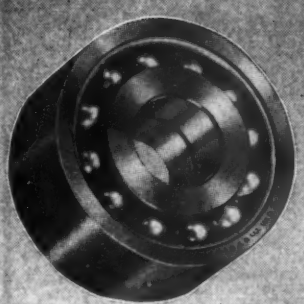
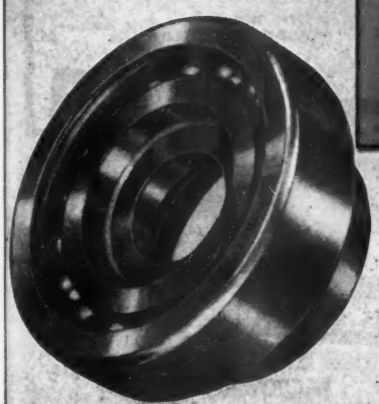
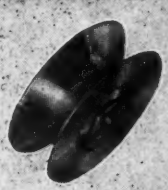
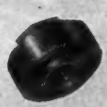
FOR EVERY TYPE OF INSTALLATION









SCHATZ MANUFACTURES BALL BEARINGS FOR EVERY PURPOSE AND ANY PRODUCT

STANDARD TYPE OR MADE TO YOUR SPECIFICATIONS

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A helical-type driven gear on the main spindle of the Gisholt Simplimatic — famous high-speed, high-production automatic lathe — is made of Ampco Metal.

M-12

Protection against costly metal failures:

Machine tool parts of wear-resisting AMPCO METAL

provide controlled hardness; high tensile strength; stubborn resistance to wear, impact, fatigue

Leading machine tool builders (over 90 of them) protect you against breakdowns at vital frictional points by using parts of Ampco Metal — a *series* of aluminum bronze alloys tailor-made to severe operating requirements.

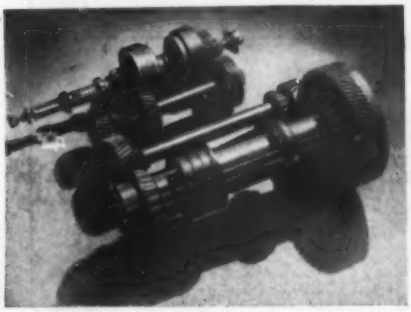
The controlled physical properties — varying from ductile and soft to rigid and hard, but having in common two prime characteristics: high strength and unsurpassed resistance to wear — give Ampco Metal several times the life of ordinary bronzes.

Check for parts of Ampco Metal, as a mark of quality in the machines you buy. And replace worn parts of your older machines with durable Ampco.

Send for "File 41 — Engineering Data Sheets." Use the coupon below.

AMPCO Metal
The Metal without an Equal

Below: Close-up of the Gisholt Simplimatic headstock transmission showing the helical-type driven gear (large one) made of Ampco Metal.



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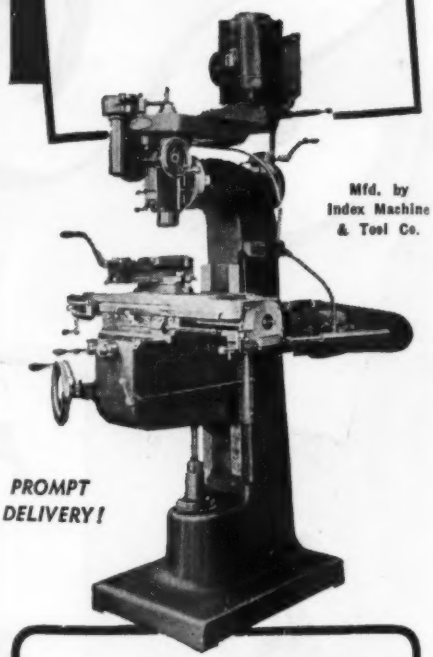
INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*

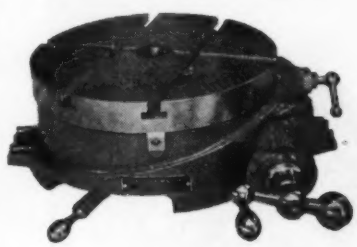


Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.



A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

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Everyone Has An Economic Stake In

INDUSTRY'S No. 1 PROBLEM

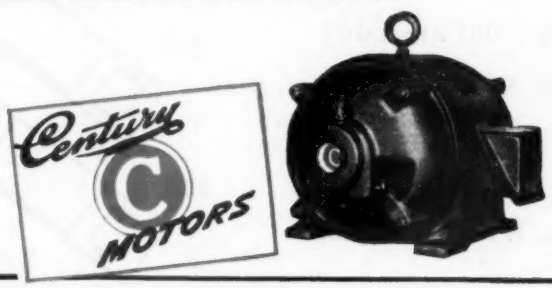
...and CENTURY MOTORS Help to Increase and Maintain Jobs by Aiding Manufacturers to Produce More and Better Goods at Lower Cost

Thousands of manufacturers of production and processing equipment and the plants that use this equipment are realistically planning to increase and maintain jobs and job security for millions by improving production methods, which, in turn, will result in more and better goods at lower costs.

How Century Motors Help Producers to Effect Lower Costs

Production and other processing equipment play a vital part in building and maintaining postwar prosperity, and electric motors are production tools, too — being a component part of the machines they drive.

The production advantages of Century Motors include the great variety of motor types available to match the functional characteristics of machine operation — their unusual freedom from vibration that contributes to closer tolerances in high speed, precision work — motor protection that means uninterrupted production in spite of hazardous atmospheric conditions — a keep-a-running ability that spells continuity of operation — permanently quiet operation that conserves human energy — and many other Century features that reflect lower final costs.



An Individual Organization Job

The answer to Industry's No. 1 Problem must come from each individual organization — not business as a whole. American enterprise can increase jobs and maintain job security at high wages only by each and every company improving its production methods. As a result, John Q. Public will be able to buy more and better goods at lower cost.

Century's Organization Helps, Too

The nation-wide organization of Century Motor Specialists is helping machine tool builders and appliance manufacturers to effect savings in original design as well as savings in production output. These men can be of greatest help while your design is in the blueprint or experimental stage.

We All Have a Stake in the Final Result

Whether you are a manufacturer of consumer products or industrial equipment, a wholesaler or retailer — you, too, have a direct or indirect stake in this problem of delivering a better product to the final user at a lower cost.

Act Now! If you are a manufacturer of motorized equipment or appliances, it may pay you to call the nearest of Century's 31 branch offices. Century may well aid you to make better products at lower costs — so that more people may buy.

CE-414

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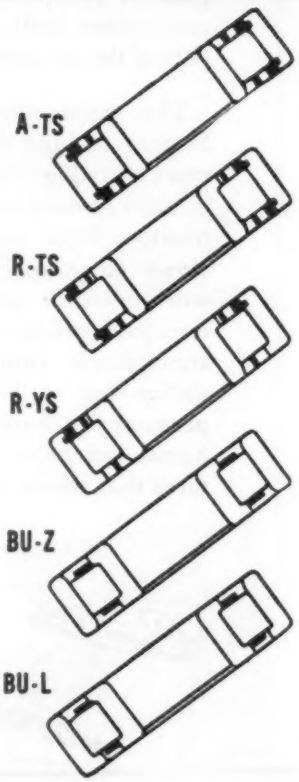
Hyatt Hy-Load Bearings are made in separable types as well as in self-contained units. In the separable bearings the inner races are the separable units in one instance and the outer races in the other. Thus, the component parts of every separable Hyatt Hy-Load type bearing of a given size are fully interchangeable. Every race fits every roller assembly.

Separable races may be assembled in one part of the shop and the rest of the bearing in another. When the sub-assemblies are brought together on the final assembly line the component bearing parts will fit correctly. No selection or matching required.

Every Hyatt A-TS, R-TS, R-YS, BU-Z and BU-L type bearing has this feature—and many others. Write for data.



HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

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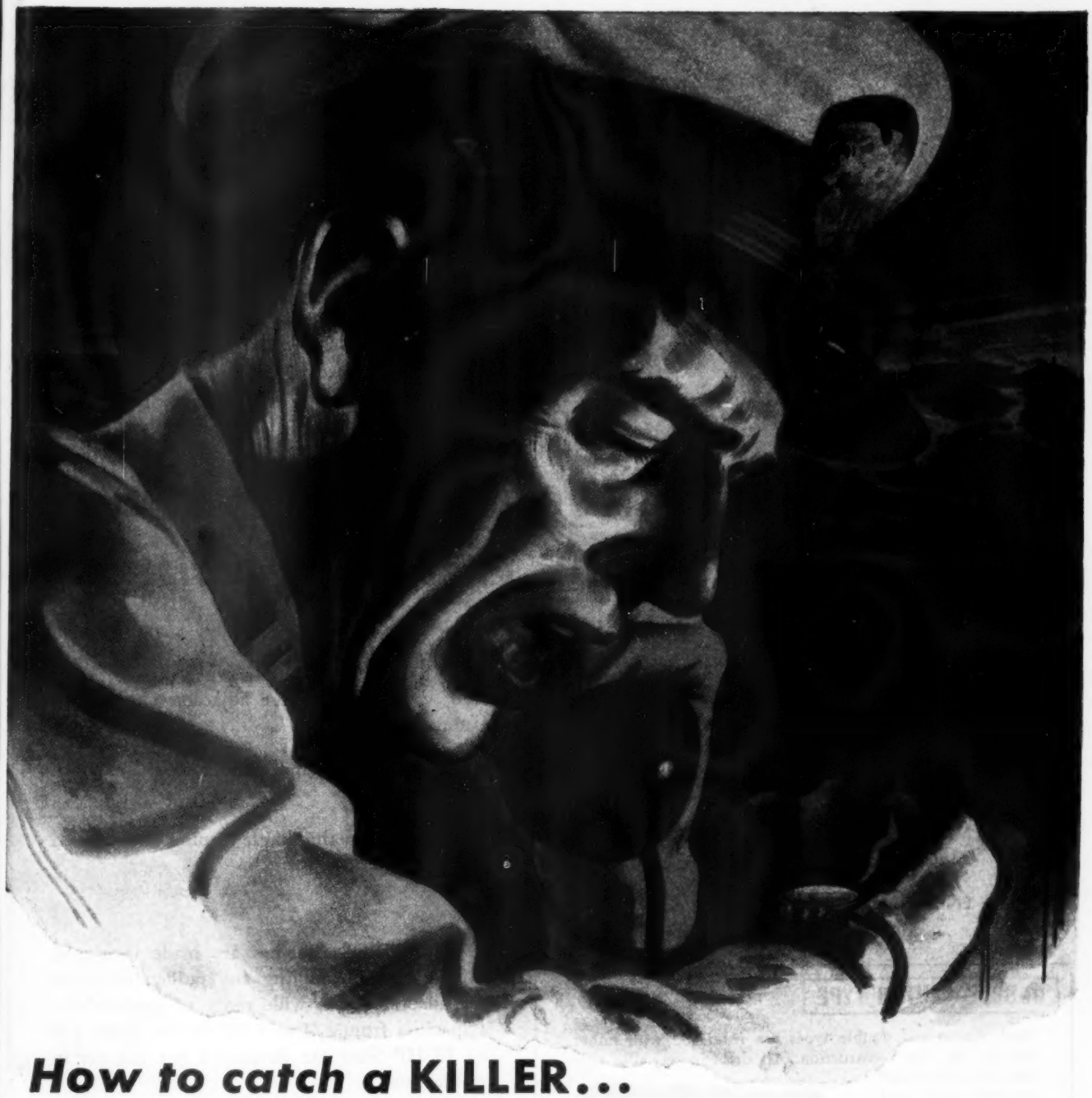

How to catch a KILLER...

day after tomorrow, at exactly 2120 hours

When an enemy raider is located hundreds of miles away, a course is laid to intercept it at a certain time, at a definite point on the map. Then having once spotted the enemy, Navy navigators keep a "running fix" on him. At the same time, they fix their own position . . . in relation to his . . . by allowing for wind and drift, *and by counting every turn of their ship's propellers*, as the turns are recorded by revolution-counting devices geared to the propeller-shafts.

These counting devices are mounted both in the wheelhouse, and on the engine-room gauge boards. And they are part of the equipment of every Naval and merchant ship . . . because they supply the basic data in the dead-reckoning of a ship's position by showing the number of shaft-revolutions made (which means distance travelled) in any given length of time. Many of these devices are made here, in The Counting House of Industry . . . made with the knowledge that on their accuracy lives, battles, and cargoes may well depend.

The Counting House of Industry

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In Canada: Veeder-Root of Canada, Ltd., Montreal
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★ The Armed Forces Count on *You* to BUY BONDS! ★

"MAXITORQ" Single Type Clutch

"MAXITORQ" SMOOTH LOAD PICK-UP *and* QUICK DISENGAGING *under all conditions!*

Improvements new to clutch design and construction account for the remarkably smooth, quiet, drag-free performance of the new "MAXITORQ". These improvements include:

FLOATING DISCS – each disc riding free and no disc in contact with those adjacent when clutch is in neutral. This feature assures elimination of drag, abrasion and heat.

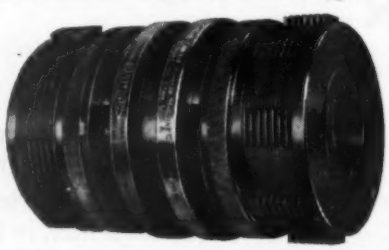
MANUAL ASSEMBLY – all parts can be removed and re-assembled by hand without the use of tools. Installation and maintenance are vastly simplified.

MANUAL ADJUSTMENT – provision for disc wear is taken care of by the simple turning of a knurled adjusting ring. No tools are required.

ENGAGEMENT: Easily controlled, with light pressure.

DOUBLE CLUTCH TYPE

Both single and double types are furnished with either wet or dry disc construction. All discs in wet disc type are of hardened and ground steel and run in a lubricant. In the dry disc type, alternate discs of steel and self-lubricating bronze are used. Illustration at right is the Double Type clutch.



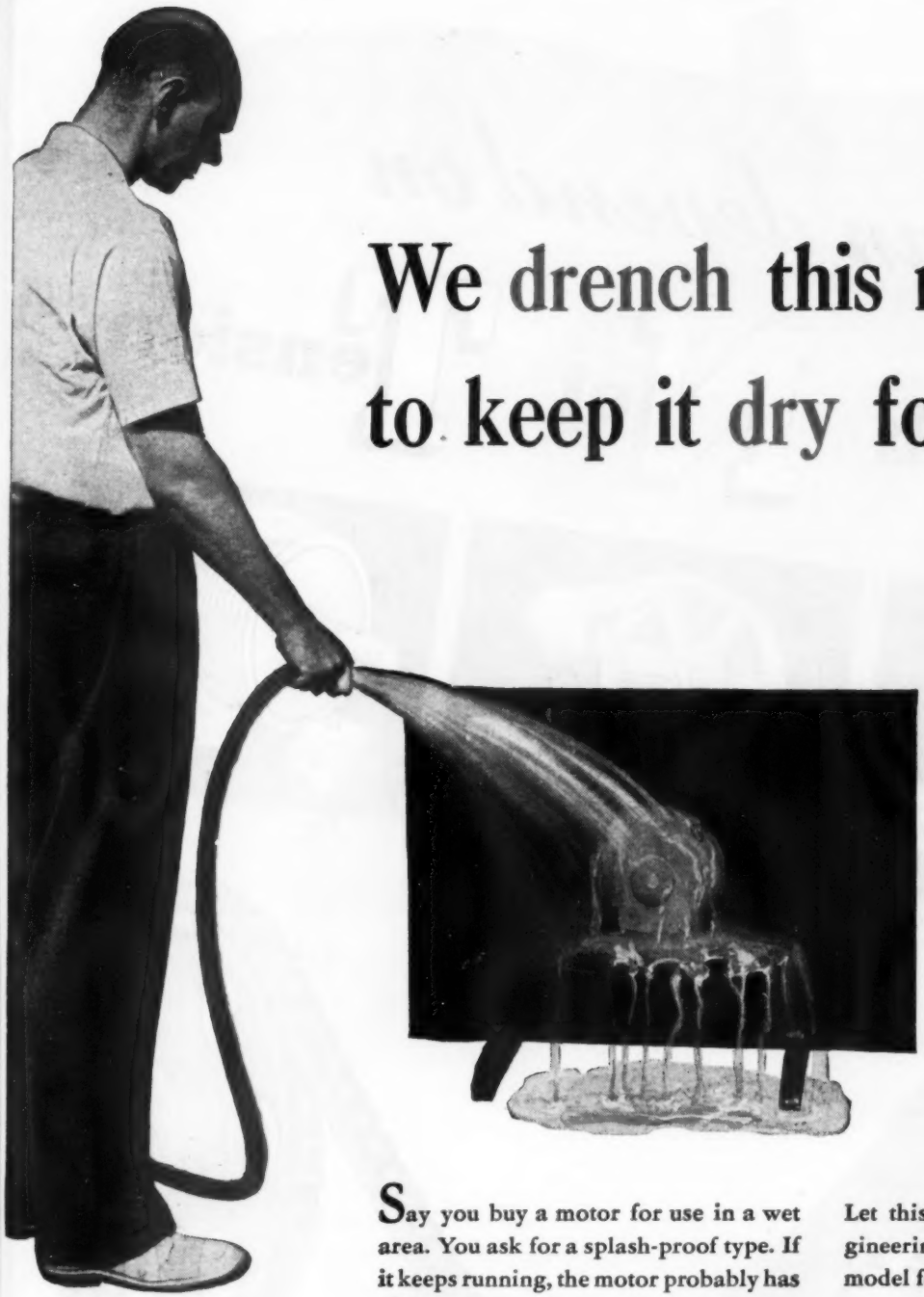
"MAXITORQ" Clutches are made in single, double, cut-off coupling and pulley types and are adaptable to a wide range of applications. Capacities from 1/4 to 5 HP at 100 RPM. (10 to 15 HP Sizes are developed but not yet in production).

Write for new catalog No. 4, giving complete details, sizes and dimensions

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER, CONNECTICUT

MAXITORQ *floating* **DISC CLUTCH**

You can see between the discs



We drench this motor to keep it dry for you!

Say you buy a motor for use in a wet area. You ask for a splash-proof type. If it keeps running, the motor probably has all the protection its name plate implies. If it stops, well . . . but then it's too late!

Knowing what you're up against, Robbins & Myers' engineers take nothing for granted. They *design* Uni-Shell Motor heads to withstand the entrance of liquids reflected against the motor. And then, they *test* them with a hose under actual operating conditions to make sure that their calculations are correct, that no water gets inside.

Let this kind of "follow-through" engineering help you decide on the right model for your motor problem. And no matter which type of motor proves to be the answer, it is *interchangeable* with any other Uni-Shell Motor of the same frame size. That's something to count on when you relocate your motor-driven equipment in the days ahead.

To help you plan, now, an illustrated 20-page booklet on R & M Uni-Shell Motors contains information you need. A copy (mention Form 1845) is yours for the asking. Send for yours, today.

SHIPMENT NOW!

Ample stock on most types of integral motors on hand as this goes to press. Wire or phone your inquiry.

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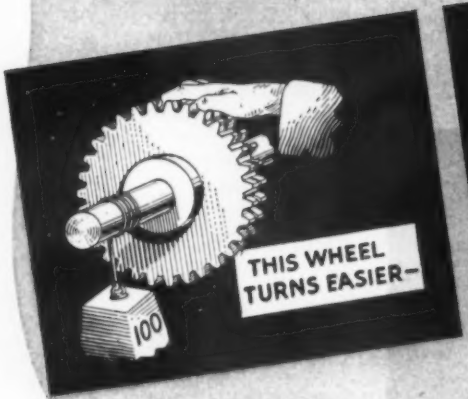
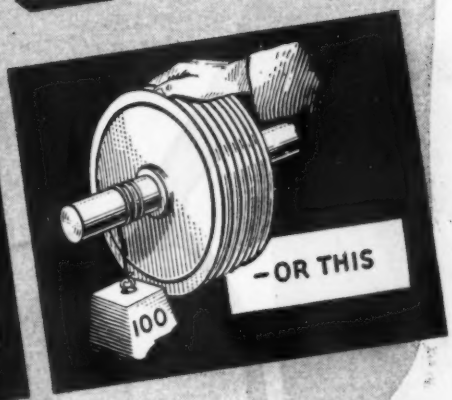
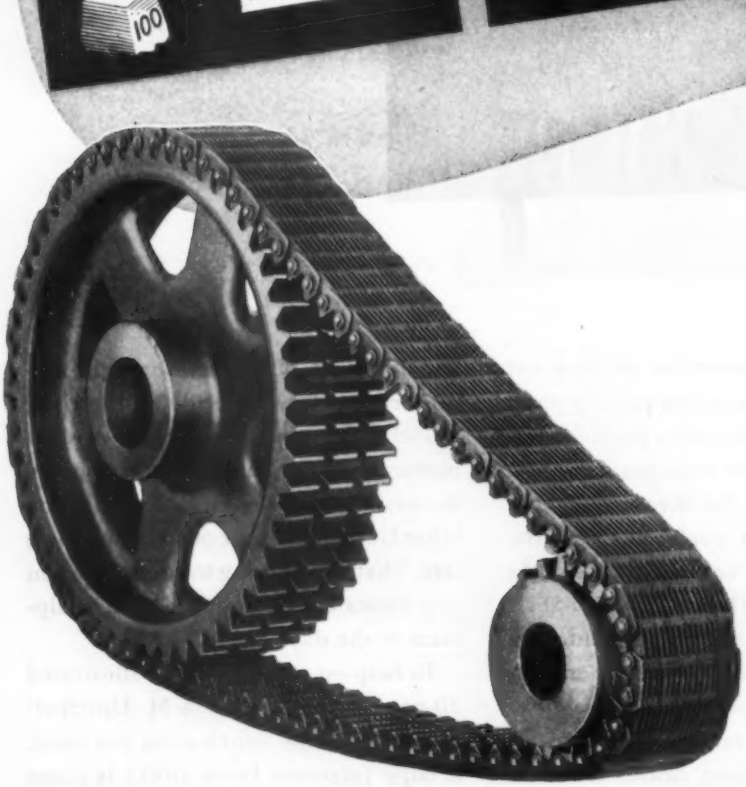
Teeth Not Tension







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MORSE Roller and Silent CHAINS

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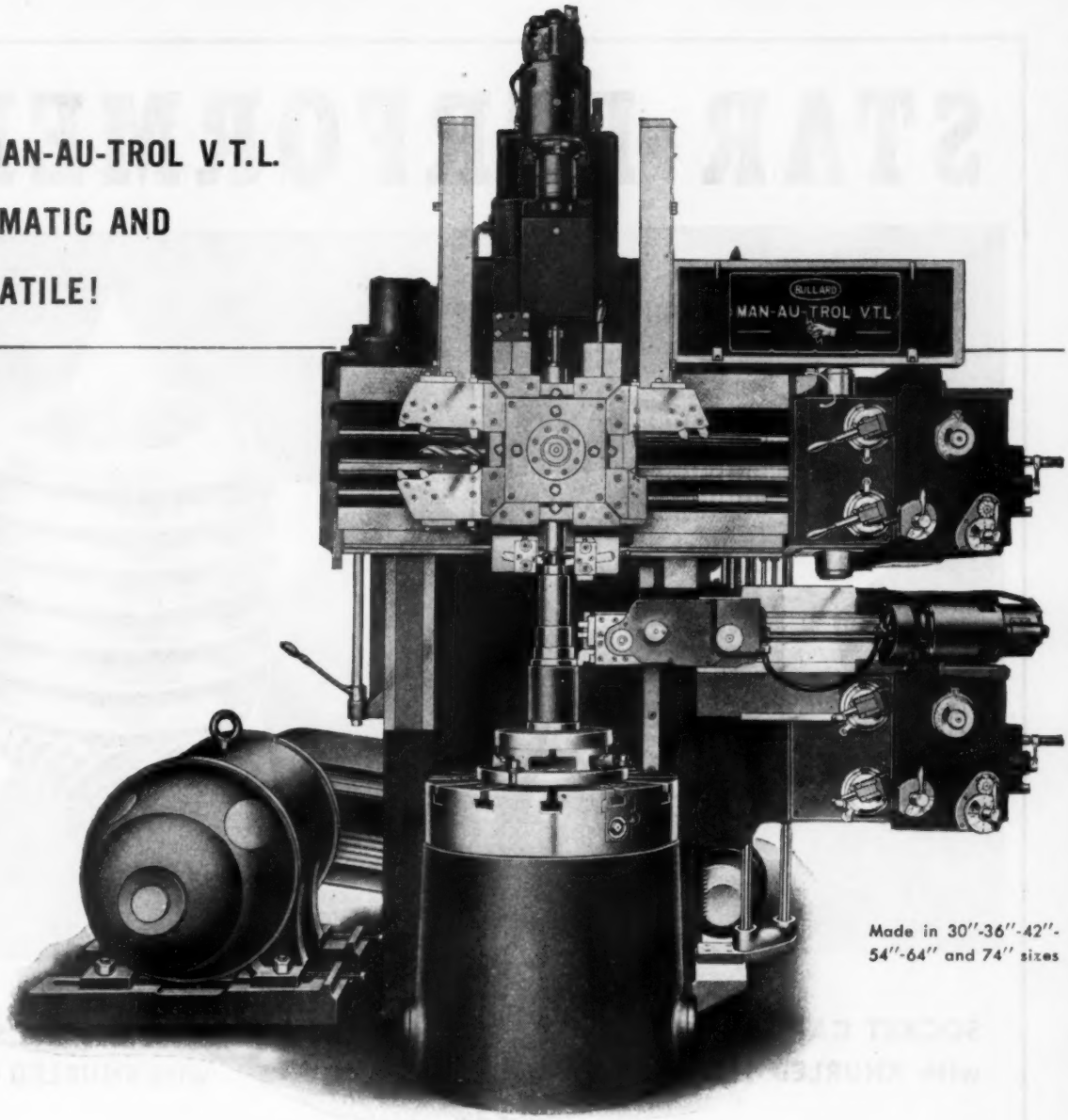
BULLARD MAN-AU-TROL V.T.L.
100% AUTOMATIC AND
100% VERSATILE!



Made in 30"-36"-42"-54"-64" and 74" sizes

Made possible by MAN-AU-TROL . . .
The automatic control that is as versatile as manual control

This new Bullard MAN-AU-TROL V.T.L. does *automatically* any and every job (involving 40 functions or less) that a manually-operated vertical turret lathe can do. Does it faster to a degree of repetitive accuracy no man can match. Can be changed over, from job to job, in a matter of hours, not days . . . without cams or similar wearable parts. Can be converted instantly to manual operation on any entirely different piece without disturbing the automatic set-up of the MAN-AU-TROL. All the while—the operator supervises production.

Think what this means to you. With a Bullard MAN-AU-TROL V.T.L. you can economically machine long runs or single units . . . can protect yourself against changes in specifications . . . can give yourself a tremendous cost advantage in competitive markets.

For complete details, write today for new bulletin on the new Bullard MAN-AU-TROL V.T.L. The Bullard Company, Bridgeport 2, Connecticut.

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MASTER OF THE MACHINE

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

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SOCKET CAP SCREW with KNURLED HEAD

UNBRAKO

REG. U. S. PAT OFF

HOLLOW SET SCREW with KNURLED CUP POINT

TIME-SAVING

A non-skid grip is provided by the knurled head of the "Unbrako" Cap Screw—a star in its own field. Mechanics' oily fingers become geared to the knurls of the socket head, enabling them to turn the screw farther and faster before a wrench is needed. Much valuable time is thus saved—and time saved means money saved! Can also be locked in place, if desired.

Strong, and made to very close tolerances, this unique screw can be used with confidence and satisfaction, especially where a first class job is imperative.

SELF-LOCKING

You can count on the Self-Locking "Unbrako" Hollow Set Screw to stay in place. The knurls of its cup point provide an absolutely dependable locking grip—they dig in and hold tight. No amount of vibration will shake this screw loose. Yet it can be easily removed with a wrench, and used again and again, without impairment to its self-locking ability.

Where the Cup-Pointed "Unbrako" is unsuitable, use our Knurled Thread Set Screw—it's also a self-locker regardless of the style of point.

Send for the "Unbrako" Catalog of Socket Screw Products for complete information.

ARMY E NAVY

Knurling of Socket Screws originated with "Unbrako" years ago.

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—are giving *BETTER SERVICE* than any V-Belts Ever Made of *NATURAL RUBBER!*

—and there is a GATES V-Belt precisely engineered to fit any special need

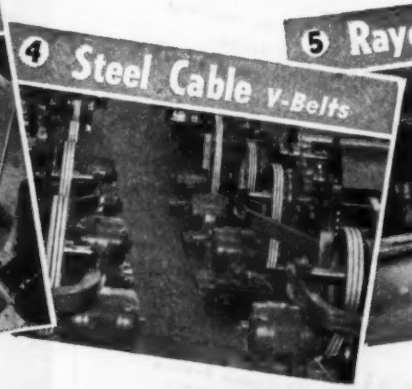
No V-Belts built by *anyone* before the war could stand the service now daily delivered by Gates V-Belts on army tanks, tractors and self-propelled big guns. Gates has developed these greatly superior VBelts through intensified, specialized research—and Gates is building these belts entirely of *synthetic rubber!*

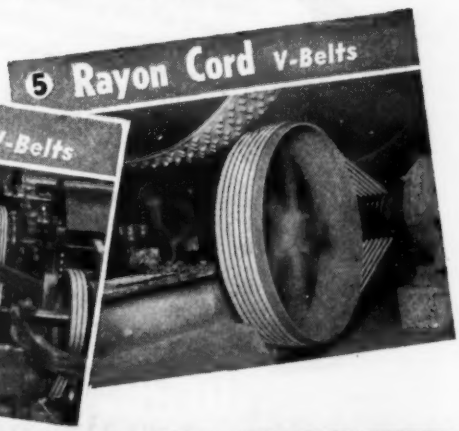
The important point, for industrial V-Belt users, is this:—Every improvement developed by Gates for these Army V-Belts has also been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.

As you know, war-time improvements in many *other* products must be withheld from general use until after the war is won—but victory depends so directly upon *production*, and production so directly upon V-Belts which drive the producing machines, that Gates has been able to give you *immediately*, in your Standard Gates Vulco Ropes, every V-Belt improvement which Gates specialized research has developed for use in the Army's motorized equipment.

In addition, where V-Belts of special construction are required, your Gates Rubber Engineer is in position to supply a Gates V-Belt that is precisely engineered to meet your special needs.

Whatever drive problem or V-Belt problem you may have, you need only pick up your phone book and look under the heading "Gates Rubber." The Gates Rubber Engineer will bring right into your plant the full benefits of every advance in V-Belt construction and in drive operation that Gates specialized research has developed.





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Mac-it **alloy steel square head set screws are milled from the solid bar with die-cut threads. Heat-treated for maximum torsional strength and to resist upsetting of the points.**

Mac-it Products Include: Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.

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MAIN OFFICE: POUGHKEEPSIE, N. Y.

CLEAR OUT THE "Fastening Bugs" BEFORE YOU SET UP FOR PEACETIME PRODUCTS

Specify the SHORT CUT FASTENING METHOD and avoid later changes, expense, delays

Don't wait until you resume manufacture of your peacetime product to find out that needless tapping, needless inserts in plastics, or other fastening "bugs" are slowing down assemblies and running up your costs.

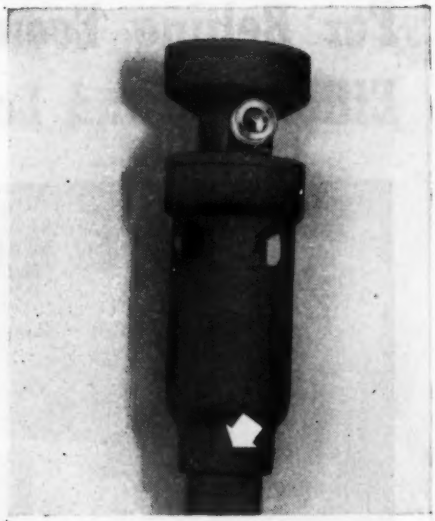
Check up *now*, while your plans are still in process. Choose fastenings as carefully as you settle any other factor of design. Make sure you are using the *short cut fastening method* – Parker-Kalon Self-tapping Screws – wherever possible.

Give your product the advantage of the 30% to 50% saving in assembly time and labor made possible by P-K Self-tapping Screws. Eliminate tapping for machine screws and tap expense – fumbling with nuts and bolts – costly inserts in plastics – riveting in hard-to-reach places.

USER'S GUIDE – FREE! P-K "Users' Guide" describes all types of Parker-Kalon Self-tapping Screws and tells where to use them. Designers and assembly planners need this important information. Write for a copy.

ASK THIS EXPERT ON FASTENINGS

how you can make your product assembly simpler and stronger, how you can save time and lower cost. The P-K Assembly Engineer gives unbiased advice, because P-K makes all types of Self-tapping Screws. He'll call at your request ... or, mail assembly details for recommendations. Parker-Kalon Corporation, 208 Varick Street, New York 14, N. Y.



Will needless tapping and faulty "line-up" slow your assembly?

Here's how Pyrene planned ahead and licked these "bugs"

This well-known maker of fire-fighting equipment, checked fastenings carefully when designing their Phomaire extinguisher. Two fastenings were needed to attach a steel cage to a steel nozzle tube permanently, and P-K Type "U" Screws were chosen for three reasons ...

1. If machine screws were used, tapping would take extra time, and tape breakage would be high because the holes do not always line up exactly. This would also cause difficulty in driving machine screws. Type "U" Screws, however, can be driven into plain drilled holes.

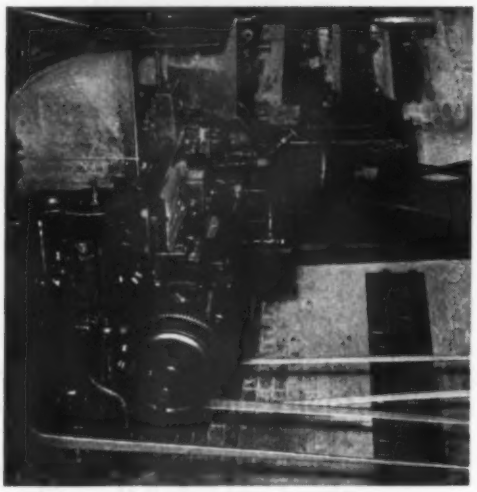
2. A tamper-proof fastening was desired, one that discouraged disassembly. P-K Type "U" Screws made this certain.

3. Because of their simplicity, P-K Screws proved the speediest fastening method, and provided complete security as well.

PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS

For Every Metal and Plastic Assembly

For Belting Economy, Efficiency and Long Life



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Rhoads Engineering Service, based on long specialization in the manufacture and application of leather belting, has helped many firms secure real savings through increased efficiency of their drives. We can help you too in planning a new drive or changing an old one.

Tannate-Rockwood drives have proved their exceptional reliability during recent years in maximum production. Tannate belts have unusual grip. They resist moisture, machine oils and many weak chemicals. Little maintenance is required to assure long life.

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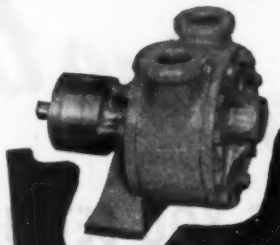
WHEN YOU NEED PRECISION-BUILT SMALL PUMPS . . . *Specify* TUTHILL



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For dependable, economical service on hydraulic mechanisms, machine tools and engines, Tuthill offers the compact Model CK internal-gear rotary pump. Designed to save space, material and money. Sizes range from 1 to 50 g.p.m. at pressures up to 400 p.s.i. Direct motor drives, V-belt units and integral drives. Write for Model CK bulletin.

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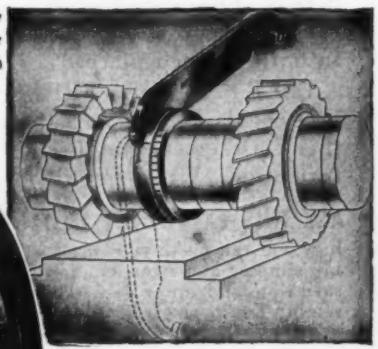
SAVE TIME ON YOUR GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling setups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown



"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅜" to 2".

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From billet to bolt

—CIRCLE Ⓑ

● The quality, accuracy and dependability of all circle Ⓑ fasteners are rigidly controlled in one integrated plant—the largest independent in the country—from billet to the finished product.

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SALES OFFICES IN PRINCIPAL CITIES

◀ The uniform quality of all circle Ⓑ products begins in our own rolling mills.

OUT OUR WAY BY J. R. WILLIAMS
GENTLEMEN, IT GIVES ME GREAT-UH-PLEASURE TO-TO-TO BE-UH-ASKED TO SAY A FEW WORDS ON TH' SHOP AND TH' WAR...
THE OL' BULL OF TH' WOODS IS AS NERVOUS AS A CAT! HE NEVER MADE A SPEECH IN HIS LIFE EXCEPT TO A GUY FER SPOILIN' A JOB!
WELL, HE'S SPOILED ONE HIMSELF AT LAST--AND WE'RE RIGHT HERE TO MAKE HIM FEEL LIKE HE USED TO MAKE US FEEL
NO, I DON'T ENJOY THAT--HE'S BEEN GOOD TO US SHOP GUYS! LET'S BREAK A DISH ER WRECK SOMETHIN' HERE AN', BOY, WILL HE COME OUT OF IT WHEN HE LOOKS AT US INSTEAD OF TH' BANKERS!
THE KING'S HENCHMEN
J.R.WILLIAMS

The Old Bull Meets His Match

Load the Old Bull up with production headaches; give him precision jobs to mass-produce at white hot speed—and he stands like a rock. But stand him before a little microphone—and he's met his match.

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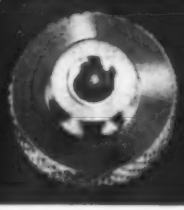

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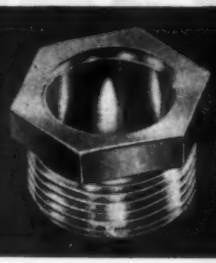

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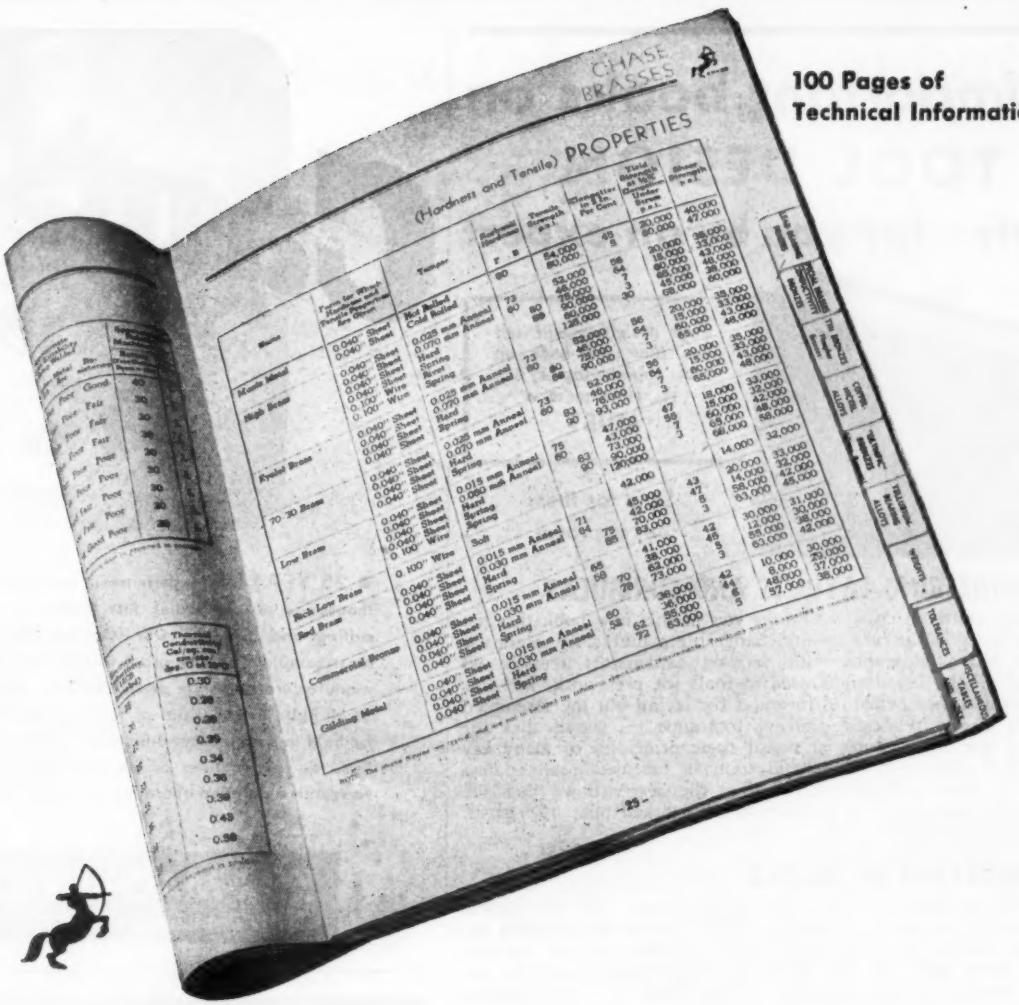

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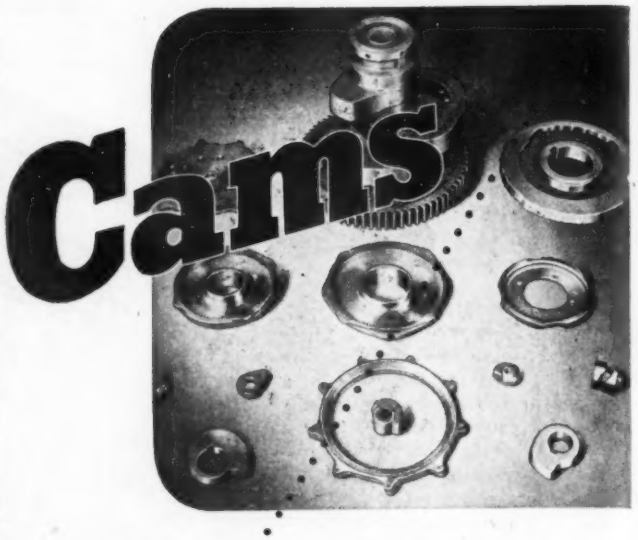

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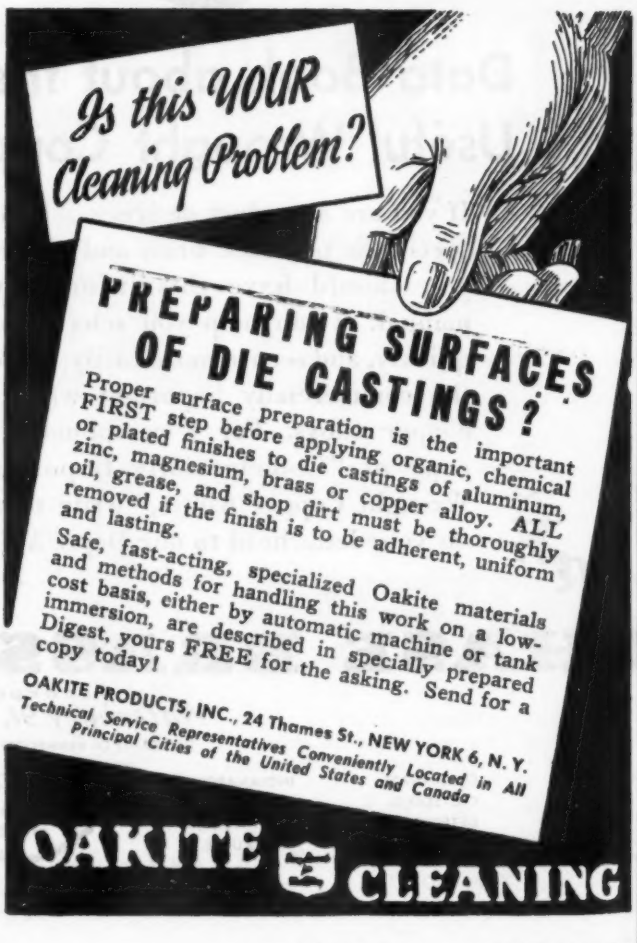
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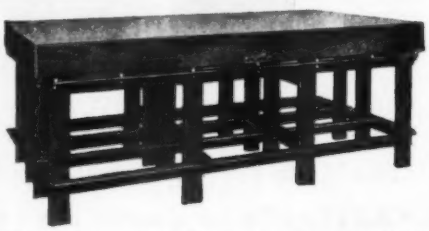

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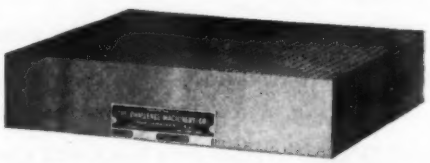

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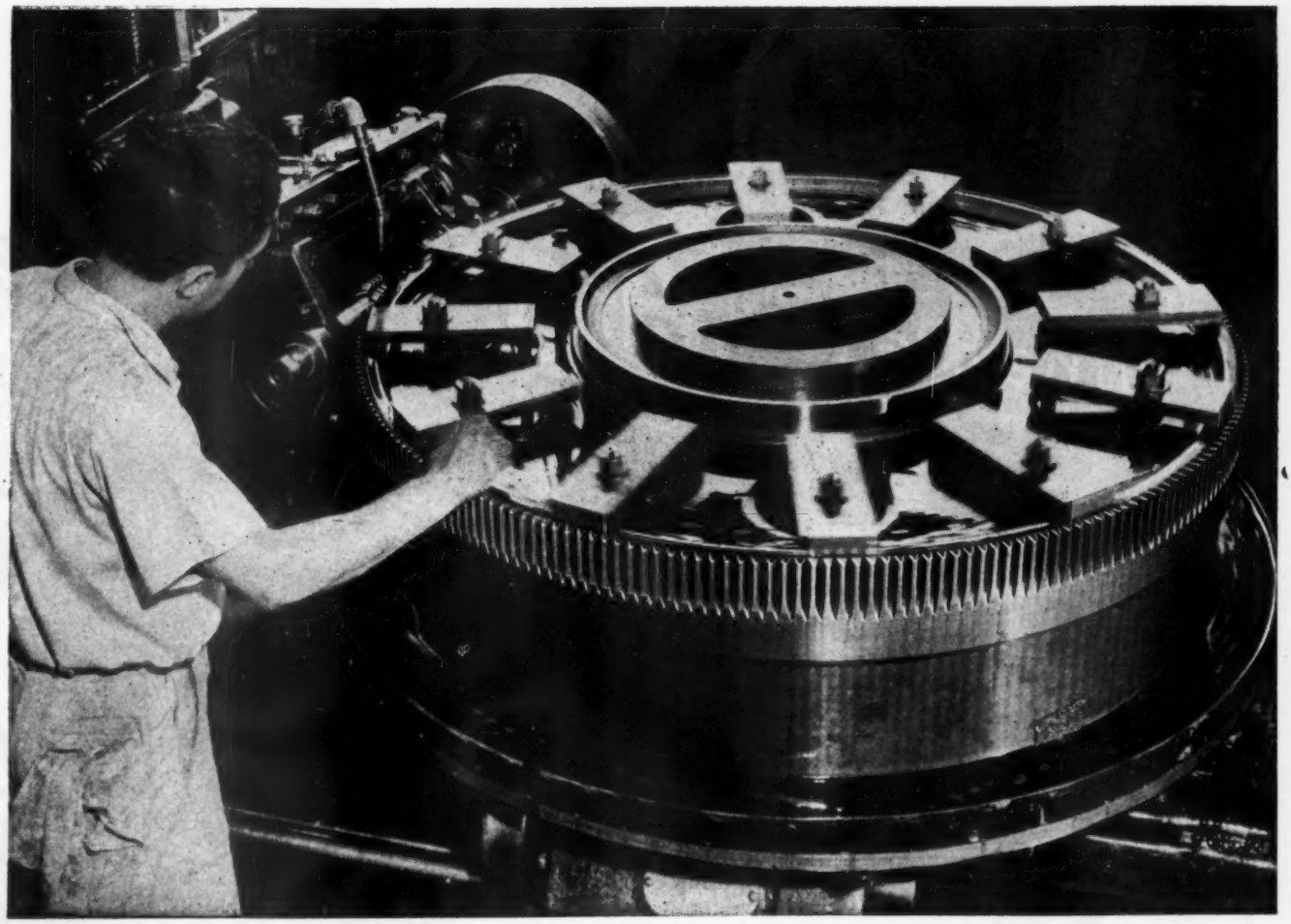

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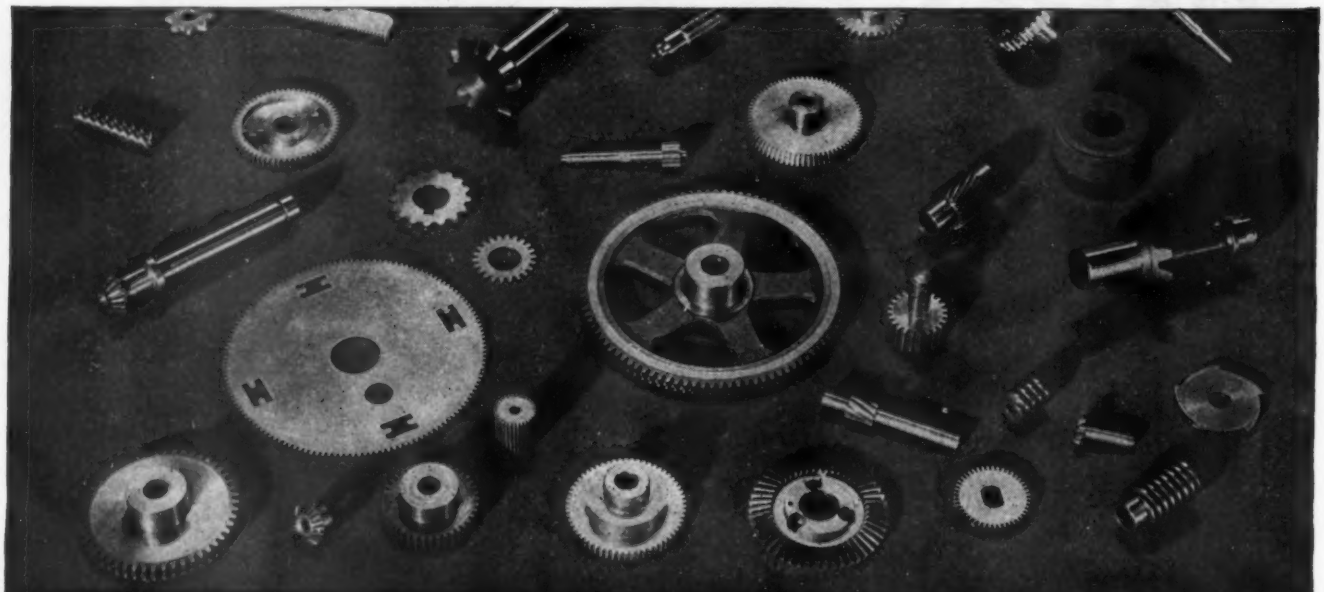

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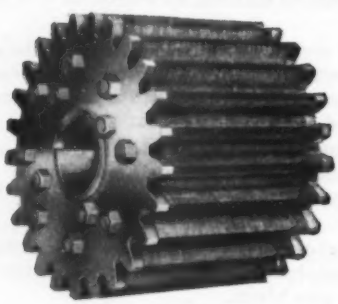

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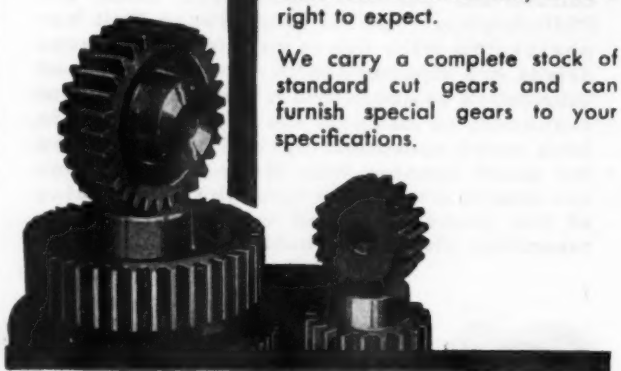

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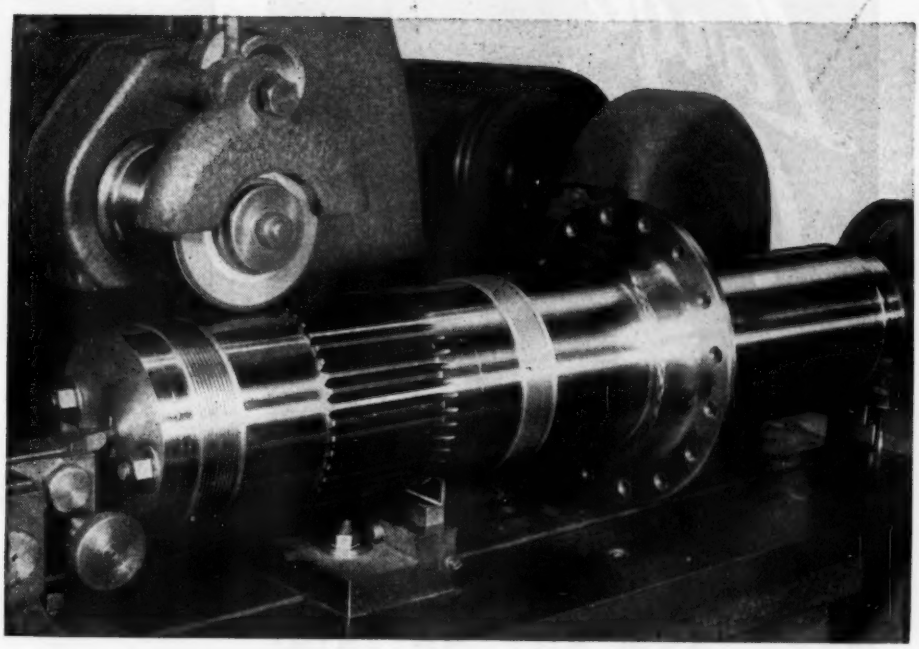

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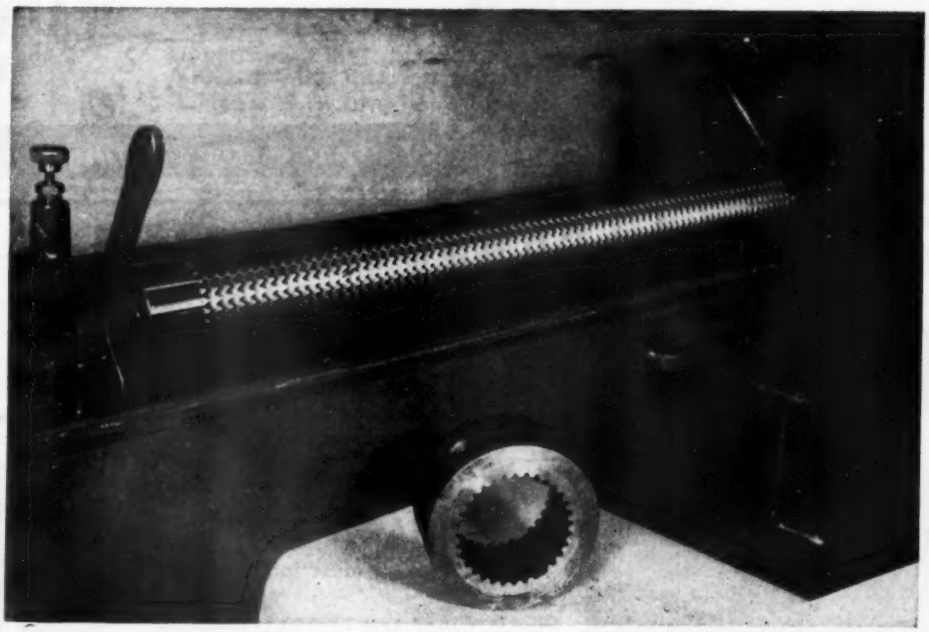

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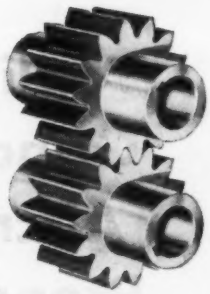

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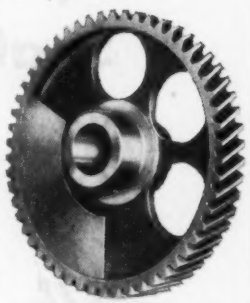

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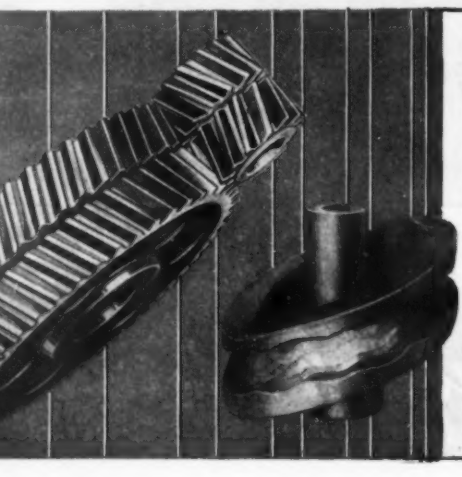

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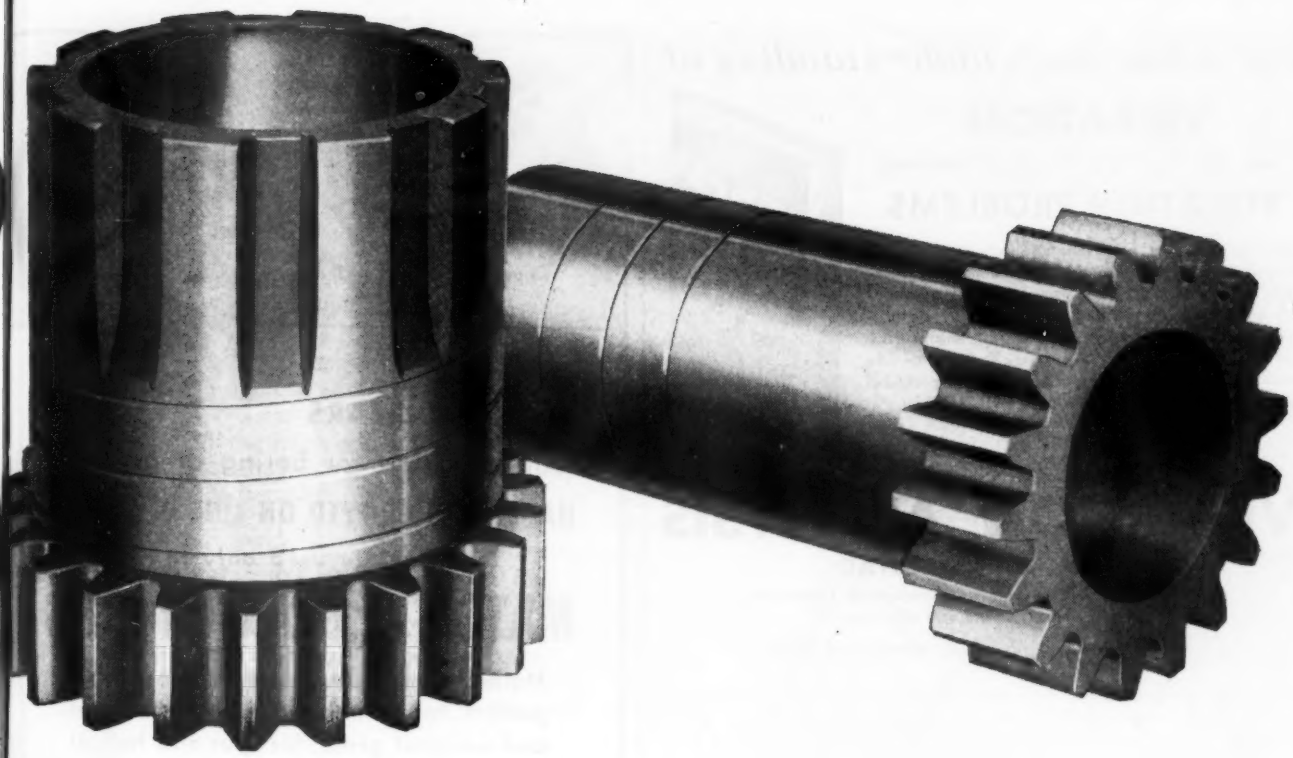

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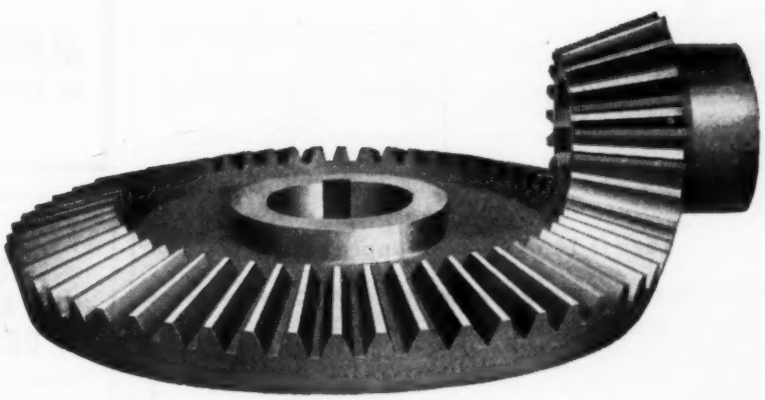

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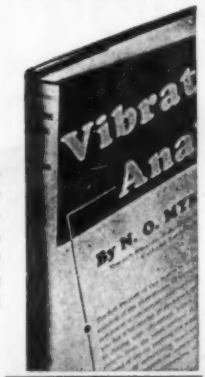
VIBRATION

and the best methods of solving

VIBRATION PROBLEMS



Here is a text of vibration analysis that gives a thorough explanation of the phenomenon of vibration, and a detailed description of the best methods of solving the most important practical vibration problems occurring in modern engineering design. Illustrated throughout with many specific examples and carefully worked-out practical problems.

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VIBRATION ANALYSIS

By N. O. MYKLESTAD

Research Associate, Guggenheim Aeronautical Laboratory, California Institute of Technology

303 pages, 5½ x 8½, fully illustrated, $3.50

This book offers a careful treatment of the fundamentals of vibration and a detailed explanation of vibration analysis, to give a full understanding of this important phenomenon. The final chapter—more than a third of the book—presents step-by-step simple tabular methods of solving problems of practical importance that involve systems of more than one degree of freedom.

Except for the problem of torsional vibrations, all these tabular methods have been specially developed by the author. Every section is illustrated by specific examples, and most of the sections provide practical problems with answers, so that the reader may check his solutions. Every design engineer concerned with the problem of vibration analysis will welcome this helpful book.

Thoroughly describes

such topics as amplitude, balancing, damping, flutter, dissipation of energy, harmonic motion, and modes of vibration. The calculations involved are illustrated by worked-out examples.

This book tells you

—how to find the uncoupled torsional modes of an airplane wing

—how to find the amplitudes coefficient for an airplane wing

—how to find the first natural mode of vibration of an overhanging beam

—how to find the critical speeds of a shaft carrying several large disks

—how to find the relative amplitudes and phase angles for linear and torsional deflections of a wing

—how to find the differential equations of motion of a single degree of freedom system

—how to plot a curve of force transmitted versus speed

—how to find the equation of motion of a freely vibrating system

—etc., etc.

Contents

Chapter I
Introduction

Chapter II
Fundamentals

Chapter III
Undamped Vibrations of Systems of One Degree of Freedom

Chapter IV
Damped Vibrations of Systems of One Degree of Freedom

Chapter V
Vibration of Systems of More than One Degree of Freedom

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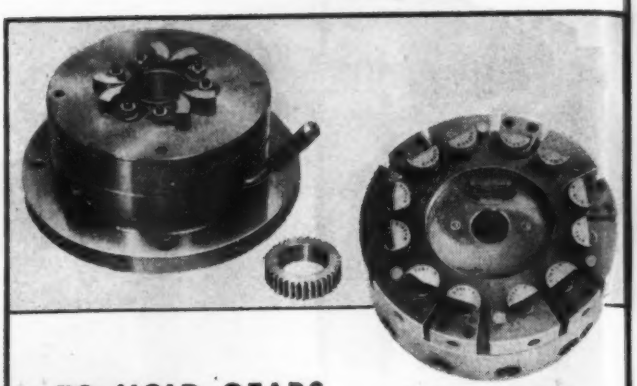

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These presses range from small compact units to large tonnage machines for handling heavy work on a traversing platform. Each is self-contained, quick-acting and oil-operated. Each performs its forcing operations smoothly, with a minimum of shock and maximum freedom from pulsation under pressure.

Only a few of the many available types and sizes of W-S Forcing Presses are shown here. Write for detailed information on these and other W-S Hydraulic Presses for forming, forging, flanging, straightening, shearing, piercing, bending, assembling, and other metal-working operations. Send for General Bulletin 110-A. The Watson-Stillman Co., Roselle, New Jersey.

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Truck braces made in three operations of .40 carbon steel 2 x 3 inch cross section bent to 5½ inch inside radius on No. 6 Bulldozer.

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For many classes of work where tremendous force is required in the fabrication of metal parts, Cleveland Steelweld Bulldozers have proven of advantage. They are ideal for forming operations in aircraft plants, shipyards, railroad, structural and forge shops.

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A complete line of Cleveland Steelweld Bulldozers is available. Quotation and detailed specifications will be furnished upon request.

If you are looking for ways of effecting production economies, you will be interested in these versatile machines. Descriptive literature will be gladly sent.

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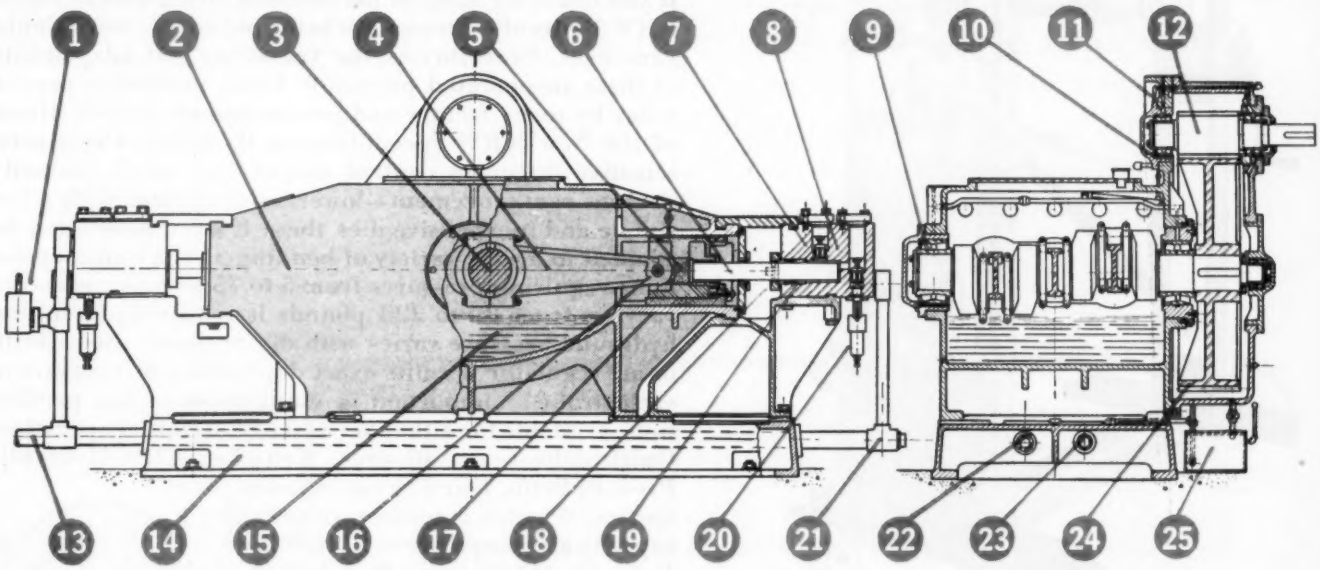
This Battery of Elmes Six-Plunger Pumps at Willys-Overland, Toledo, has been in continuous operation for several years with negligible maintenance.



1—Safety Valve.
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11—Pressure Lubrication on cross heads and drive bearings.
12—Herringbone Pinion integrally cut on shaft.
13—Discharge Port.
14—Semi-Steel Sub-Base.
15—Crank Shaft Bearings splash and pressure-lubricated.
16—Needle, Bearing Wrist Pins.
17—Piston-Type Cross Heads for long life.
18—Adjustable Packing Glands.
19—Bronze-Lined Stuffing Boxes.
20—Pump Unloader.
21—Suction Port.
22—Discharge.
23—Suction.
24—Enclosed Herringbone Gear Drive, splash lubricated.
25—Sump for circulating lubricant.

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The Elmes Six-Plunger Horizontal Pump is the master of any situation. Six opposed plungers impart overlapping impulse for uniform flow, balanced operation. The rigid, one-piece cast housing (shaded area on drawing) absorbs shocks, maintains alignment. Efficient, compact, durable design assures top performance, low maintenance, easy servicing. Many of the novel features are patented. Sizes range from 150 to 500 horsepower; pressures to 35,000 p.s.i. Elmes builds the right pump for every operational need. Since 1851 Elmes hydraulic equipment has served all industry. Elmes Engineering Works of American Steel Foundries, 1001-1013 Fulton St., Chicago 7. Also manufactured in Canada.

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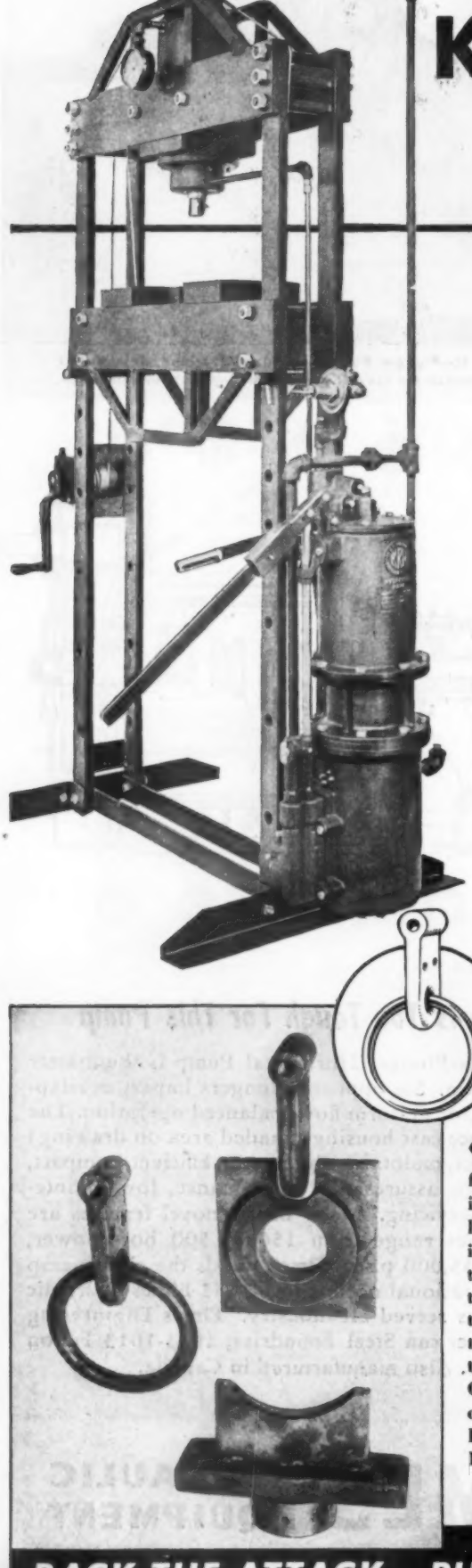

The KRW HYDRAULIC Efficient

EQUIPPED WITH PATENTED KRW SPEEDI-BOOSTER AND USING LOW-COST DIES, IT DOES THE WORK OF EXPENSIVE PRESSES AND BENDING MACHINES ON SHORT-RUN PRODUCTION

If you could see some of the manufacturing uses to which KRW Hydraulic Presses are being put today, you'd doubt your eyes. Nevertheless, the versatility and adaptability of these air-operated presses is being profitably proven today by many factory and production executives. Heart of the New KRW Speedi-Booster Hydraulic Press is its sensitive finger-tip control mechanism which instantly governs ram movement—lower, raise or stop. With a few simple and inexpensive dies these KRW Presses can be adapted to a wide variety of bending and pressing operations requiring pressures from 5 to 75 tons. Air pressure varying from 80 to 225 pounds is required—resulting hydraulic pressure varies with air pressure used. Built-in air regulator permits exact duplication of pressure at each stroke . . . important in many types of fast production. Available for either vertical or horizontal operation. Quick delivery on all sizes. Write for KRW Hydraulic Press Bulletin. Our Engineers are at your service. We also manufacture suitable capacity air compressors. K. R. Wilson, Dept. 11, 215 Main St., Buffalo 3, N. Y.

5/8" CRS RING

With the simple dies shown, quickly made from stock steel, this 6-inch ring is made with but four feeding passes into the lower die. Before the radius is completed, the shackle is inserted into the die notch, permitting the ring to "thread the eye" of the shackle. Closing ring by welding completes operation. EQUIPMENT: 25-ton KRW Press.

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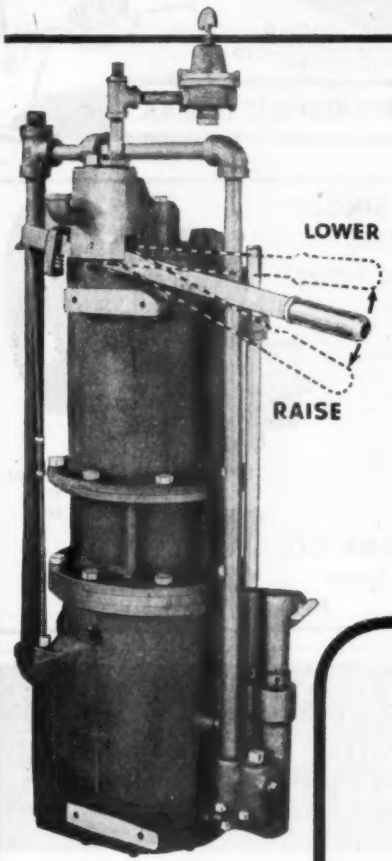
ARBOR PRESS IS AN PRODUCTION MACHINE



THE KRW SPEEDI-BOOSTER WITH FINGER-TIP CONTROL Instead of capstan wheel or pumping lever, the KRW Speedi-Booster utilizes compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is controlled with the slightest finger-tip movement of the lever. Thus worker fatigue is greatly reduced, full and instant control obtained.

3/4" CRS CRANK HANDLE

This special crank handle — required in small lots—is completely shaped in two operations on the same press with the aid of low-cost V-shaped die and matching ram head. To conserve space, a horizontally-operating press is used for this and other small work. The low cost dies were made from available pieces of scrap steel welded and machined.

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AIR PRESSURE	7" AIR CYLINDER		9" AIR CYLINDER	
100 TO 200 POUNDS	2" Oil Cylinder	1¾" Oil Cylinder	2" Oil Cylinder	1¾" Oil Cylinder
	10 to 22 Tons	14 to 29 Tons	17 to 35 Tons	23 to 47 Tons

75 TON PRESS

AIR PRESSURE	9" AIR CYLINDER	
100 TO 200 POUNDS	2" Oil Cylinder	1¾" Oil Cylinder
	25 to 51 Tons	33 to 68 Tons

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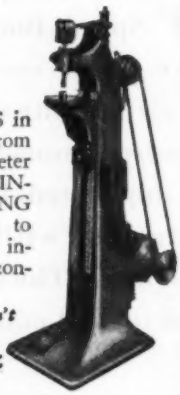

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Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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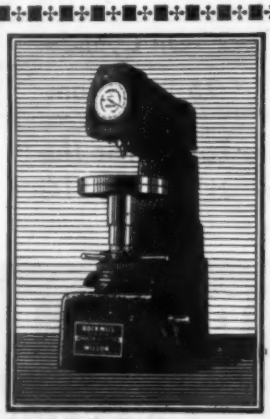

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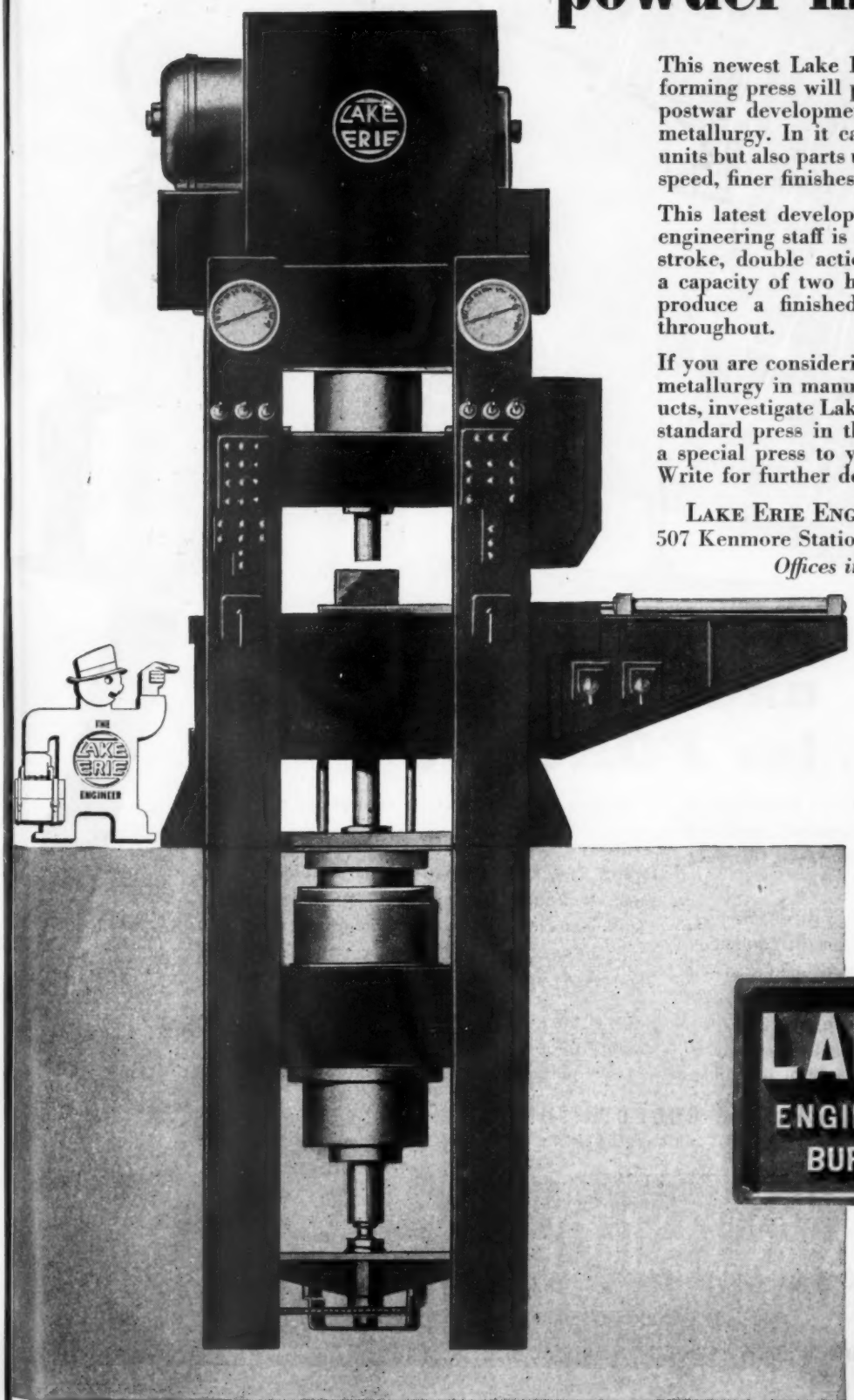
CASE HISTORIES PROVING THE POWER OF THE PRESS

Another step forward in powder metallurgy



This newest Lake Erie hydraulic powder metal forming press will play an important part in the postwar development of the science of powder metallurgy. In it can be formed not only small units but also parts up to 100 pounds, with greater speed, finer finishes and closer tolerances.

This latest development of Lake Erie's skilled engineering staff is a four column, up and down stroke, double action, self-contained press with a capacity of two hundred tons. Opposing rams produce a finished piece of uniform density throughout.

If you are considering the advantages of powder metallurgy in manufacturing your postwar products, investigate Lake Erie's ability to deliver this standard press in the near future or build you a special press to your particular requirements. Write for further details.

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507 Kenmore Station Buffalo 17, New York
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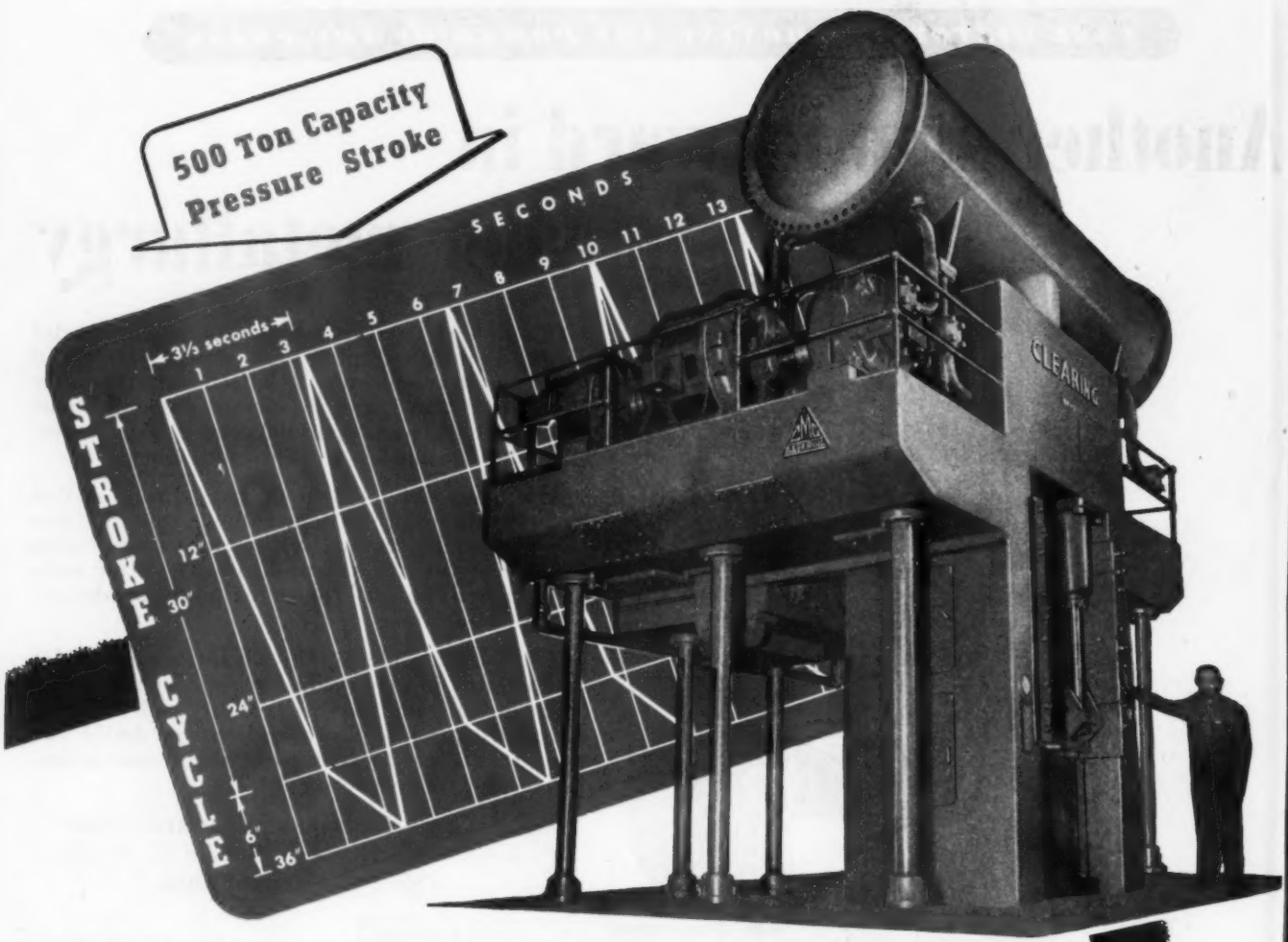

SPEED and POWER .... for *FORGING*

Nowadays there's no need to settle for anything less than exactly the kind of forging press you want and need. Take for example the latest Clearing Hydraulic Forging Press above.

This product of Clearing engineering skill and ingenuity was built to meet certain specific conditions. With 500 ton capacity and a 62" x 42" bed area, the ram travels up to 1800" per minute on approach, 270" per minute on the pressing stroke, and 2160" per minute on the return. Clearing design provides other features such as automatic cycle control, gib guided slides and precision inching control for diesetting.

Probably your forging press requirements are different. The point is, whatever you want in a forging press, hydraulic or mechanical, you can get it in a Clearing machine. The many problem-solving features that have won such widespread acceptance for Clearing Presses can make money for you too.

Get all the facts about what Clearing equipment can do for your operations. Write us today about your press requirements, present or future.

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MECHANICAL AND HYDRAULIC PRESSES
for such operations as
DRAWING • BLANKING • PUNCHING • FORGING

CMC CLEARING

This Wartime Application of ETNA Swaging Units may hold the answer to your Postwar production-machining and handling problems!

Clearly demonstrated here are the benefits of fewer machining operations, reduced production time and labor costs and elimination of metal waste that you may expect from an ETNA Swaging Machine installation in your plant.

The ETNA Unit shown here is, in the words of its owner, "giving excellent performance" in producing rocket bomb casings. The machine is automatic in operation . . . each casing swaged after first being heated in the furnace at the left. Production figures obviously cannot be given but we can assure you that the rate is a definite recommendation for these Swaging Units.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

Ask ETNA about Swaging

The ETNA Machine Company

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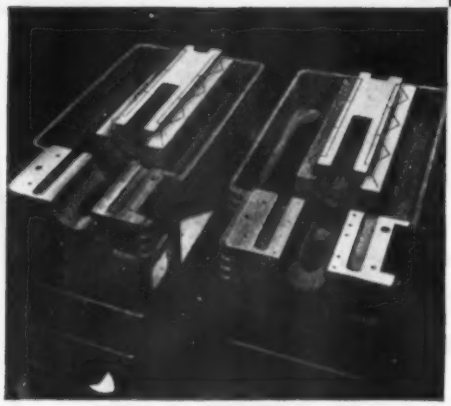
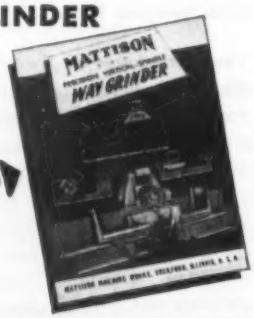
The advantages of Swaging as illustrated here are worthy of your special consideration from a standpoint of present and future needs. Let ETNA help you with your postwar thinking. Write explaining your operations . . . we'll be glad to render engineering assistance on any tapering, reducing or sizing operations.

TIME CUT FROM 10 HOURS TO 1½ HOURS

WITH MATTISON WAY GRINDER

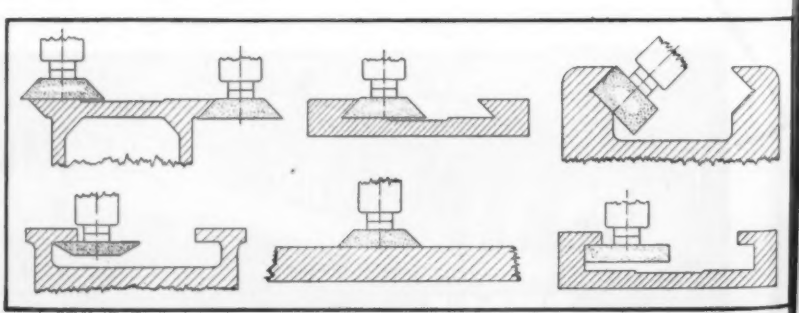


SEND FOR FREE CIRCULAR GIVING FULL DETAILS REGARDING THIS NEW WAY GRINDER



The two Boring Machine bases shown above are ground in 3 hours (1½ hours per casting) on the Mattison Precision Vertical-Spindle Way Grinder as compared to 10 hours each previsouly required for hand scraping. Head pads and ways are ground in one setting, being finished in perfect alignment. Because of time savings like this, man hours have been cut 75% in the finishing department of a prominent Detroit manufacturer.

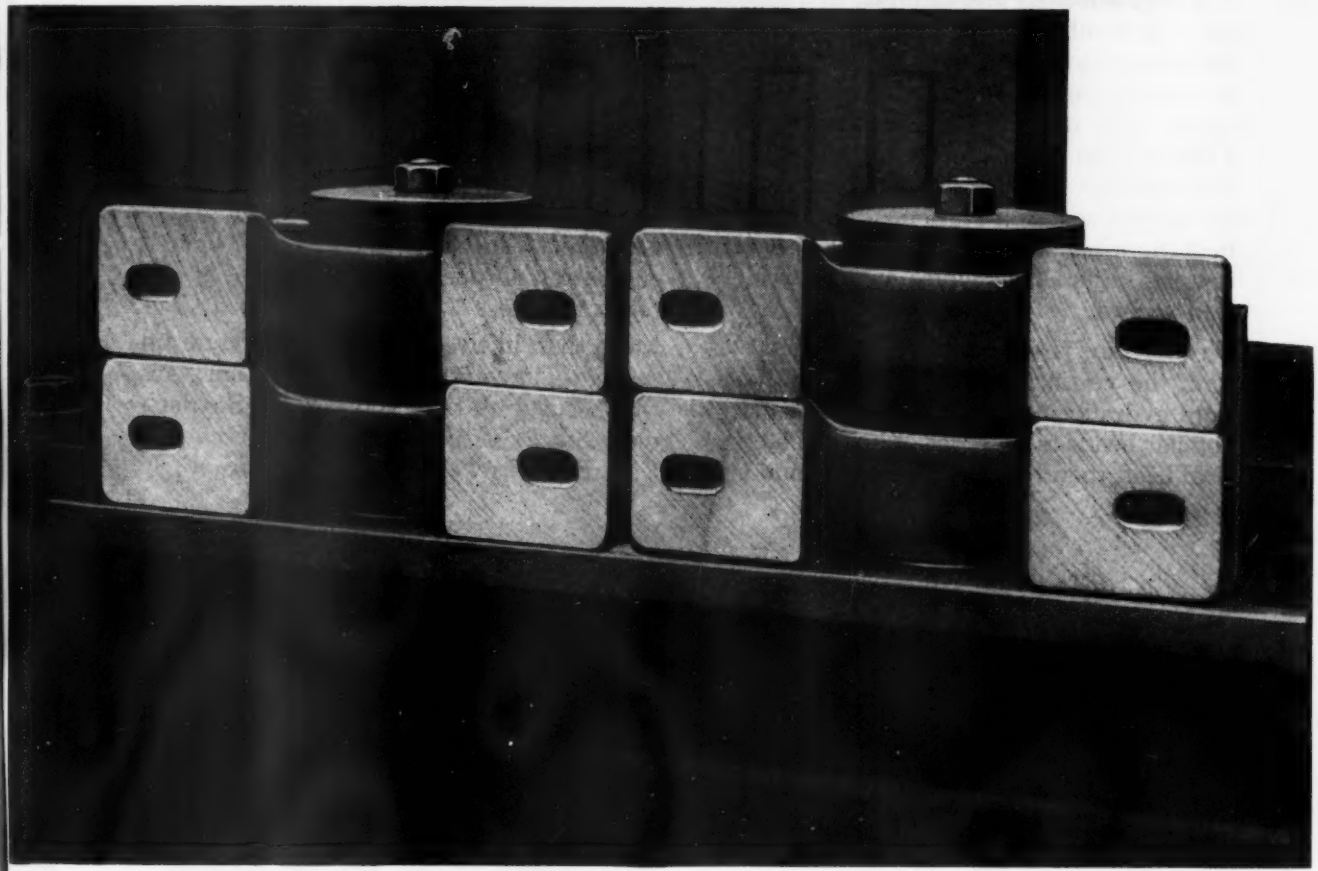
Tables, Slides, Saddles, Heads, and other parts having angular ways or surfaces are ground to closest accuracy and fine finish with the Mattison Way Grinder. You are able to eliminate the costly hand scraping operation as well as finish parts having hardened ways.



MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

WHAT? FINISH THESE SURFACES IN 6 MINUTES?



This story would be hard to believe if it weren't true. The job was a bearing pedestal of close-grained cast iron, 13" long by 3⅜" wide, surfaced one side as shown. About ¼" stock had to be removed.

With your experience, we leave it to you to estimate how long it would take to machine such a piece, especially when flatness had to be held to less than .0015".

On a Diamond Face Grinder four pieces were finished in 6 minutes or 1½ minutes per piece! If necessary, a further reduction could have been made by ganging up six or more at one time.

If you want to see real speed in face grinding as compared with machining, write for the new Diamond Face Grinder Bulletin 44-G today . . . and be prepared for a surprise!

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Gentlemen: Please send me promptly your Bulletin 44-G which shows how to speed-up production with the Diamond Face Grinder.

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MACHINE COMPANY
OF PHILADELPHIA

Two-Position MULTIPLE TAPPING MACHINE *by Snyder*

This is a special-purpose machine designed and built by Snyder for multiple tapping operations on a large aircraft part.

The part is loaded and clamped in a fixture on a hydraulic sliding table. In the first working station there are vertical and angular tapping units equipped with multiple heads and tapping spindles having individual lead screws. The vertical unit is hydraulically lifted to facilitate loading. In the second working station, there are vertical multiple and single spindle angular tapping units. All spindles have individual lead screws.

The machine is semi-automatic. In first station, the vertical head is moved into position hydraulically and both vertical and angular heads tap a series of holes. The vertical head then returns to rear position and the part automatically moves to second station, and vertical and horizontal heads go through the tapping cycle.

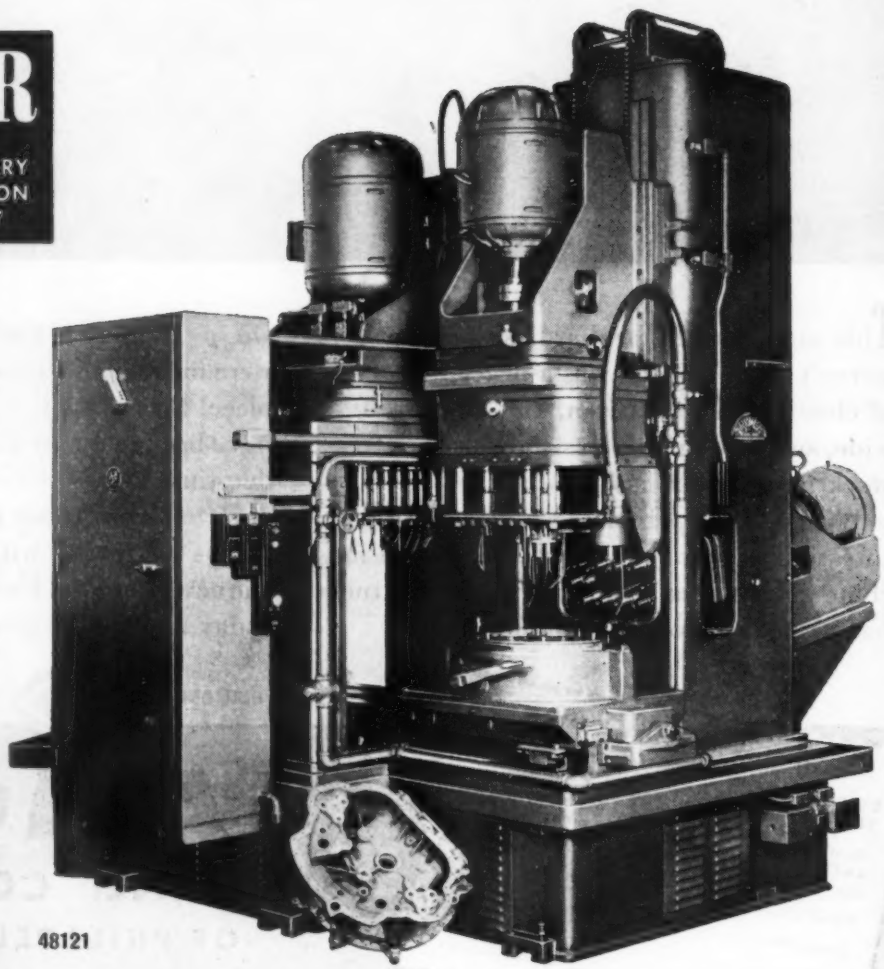
Fixture and slide then automatically return to loading station and the part is finished. All lead screw tapping spindles are equipped with safety spindle ends and floating tap holders. This protects the tap from being broken and the work piece from being spoiled.

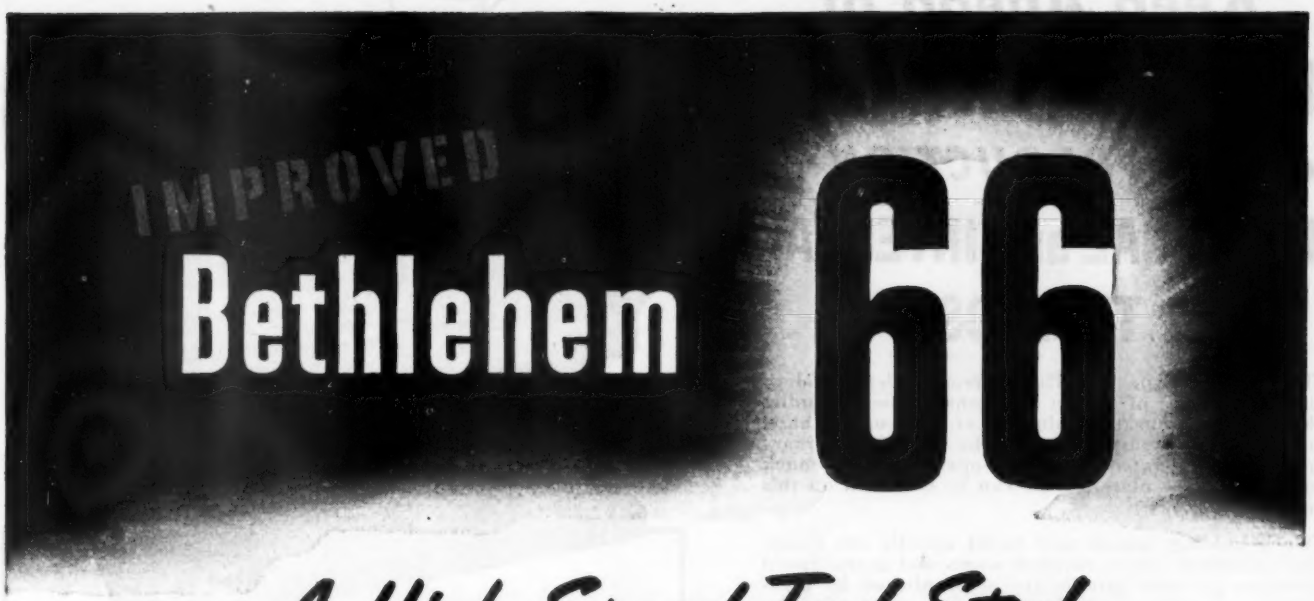
The automatic control of quality and precision and the safeguards built into this unit are typical of the efficiency which is engineered into every Snyder special-purpose machine.

More than likely, such machines figure importantly in your post-war production plans, which suggests that you consult Snyder—now. *Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries.





A High-Speed Tool Steel that's Better than the High-Tungsten Types

Better cutting edge . . . abrasion-resistance . . . shock-resistance

The war has broken down some of the old traditions that clung for years to certain grades of tool steels. One of these concerned the steels of the high-tungsten types. During the war years, Bethlehem 66 has successfully uprooted many of the old prejudices, for it has proved itself definitely superior to 18-4-1 in almost every conceivable type of heavy production work.

From coast to coast, huge plants in the automotive, electrical, machine tool, steel, shipbuilding, and munitions industries have been using Bethlehem 66 High Speed for lathe, planer, and shaper tools; on automatic screw machines, boring mills, wheel-turning and roll-turning lathes, etc. In the machining, ..ning, and milling of all kinds of heavy and light products for war uses . . . such as armor plate, gun and shell forgings, and many other types of equipment . . . the results with 66 High Speed have consistently surpassed those obtained with the straight high-tungsten analyses.

Despite these excellent results Bethlehem continued its research and experiment. Now, after months of intensive shop and laboratory work, an *improved* analysis of 66 High Speed has been made available. The averages of its leading components are as follows:

C	Mn	Si	Cr	W	Mo	V
.84	.30	.30	4.20	6.50	5.00	1.90

When you use the improved 66, you're using an analysis that has been subjected to the most exhaustive and severe tests yet devised. This new analysis has already been approved by tool-steel users of nation-wide reputation. It's not only better than the old high-tungsten steels . . . it's superior, even, to the former 66 composition. That's real performance!

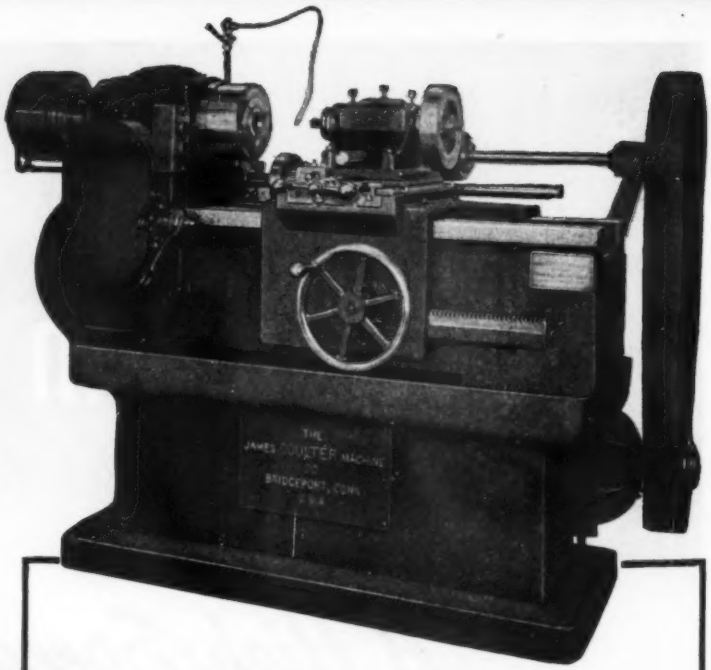
Ask a Bethlehem man for full details

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Bethlehem Steel Export Corp., New York City

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

Improved 66 *High-Speed* . . . one of Bethlehem's BIG 8 Tool Steels

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING *Units*

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

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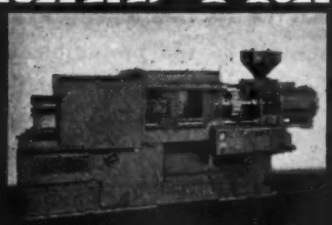

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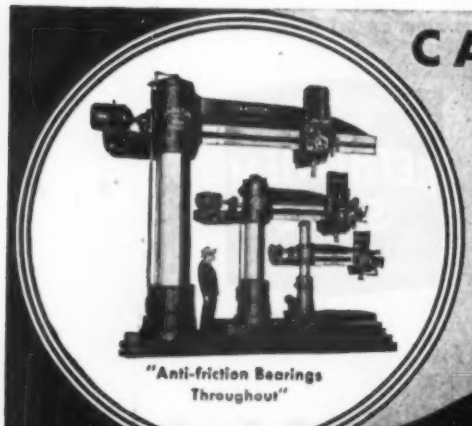
MACHINE REED-PRENTICE CORP. WORCESTER 606 MASS. U.S.A.



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

"GET A MILLING MACHINE FOR THAT JOB QUICK—FROM ANYBODY!"

The ORDER-FROM-ANYBODY-DAYS are Over!

No. 1-14...32"x9" table...14" table travel...hydraulic table feed...full automatic cycle.

Reconversion-minded production men today look for utmost *dependability*...*economy*... and *flexibility* when they order milling machines—because they're buying now for *permanent* business! That's why more and more experienced shop men today call on Kent-Owens!

With practical features that appeal to the man on the job... these machines are adaptable to a wide range of work. Rugged... simple... efficient...for your needs today *and tomorrow!* Write for latest bulletins. Kent-Owens Machine Co., Toledo, Ohio.

Call on KENT-OWENS for Milling Machines

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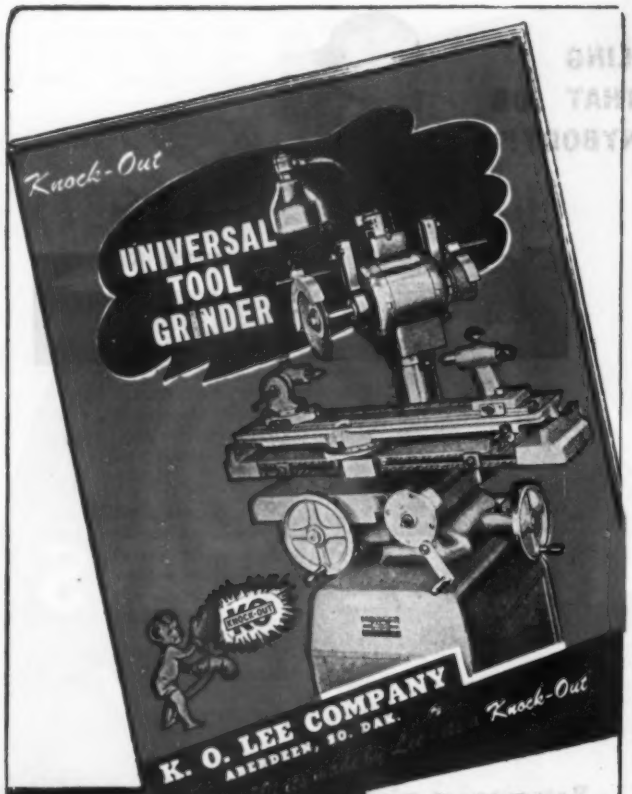

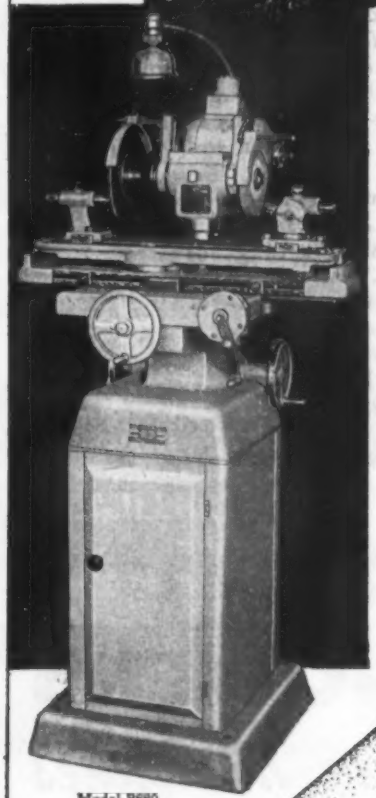

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Illustrative literature just off the press is now available for the asking. Fifty-two operating pictures, latest improvements in tool grinders. Many time saving grinding fixtures that are adaptable to any make tool grinder.

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NINE OPERATING SPEEDS
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PRICE
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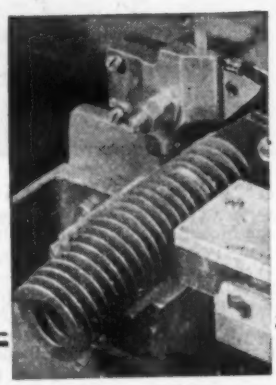
ST. LOUIS MISSOURI

LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

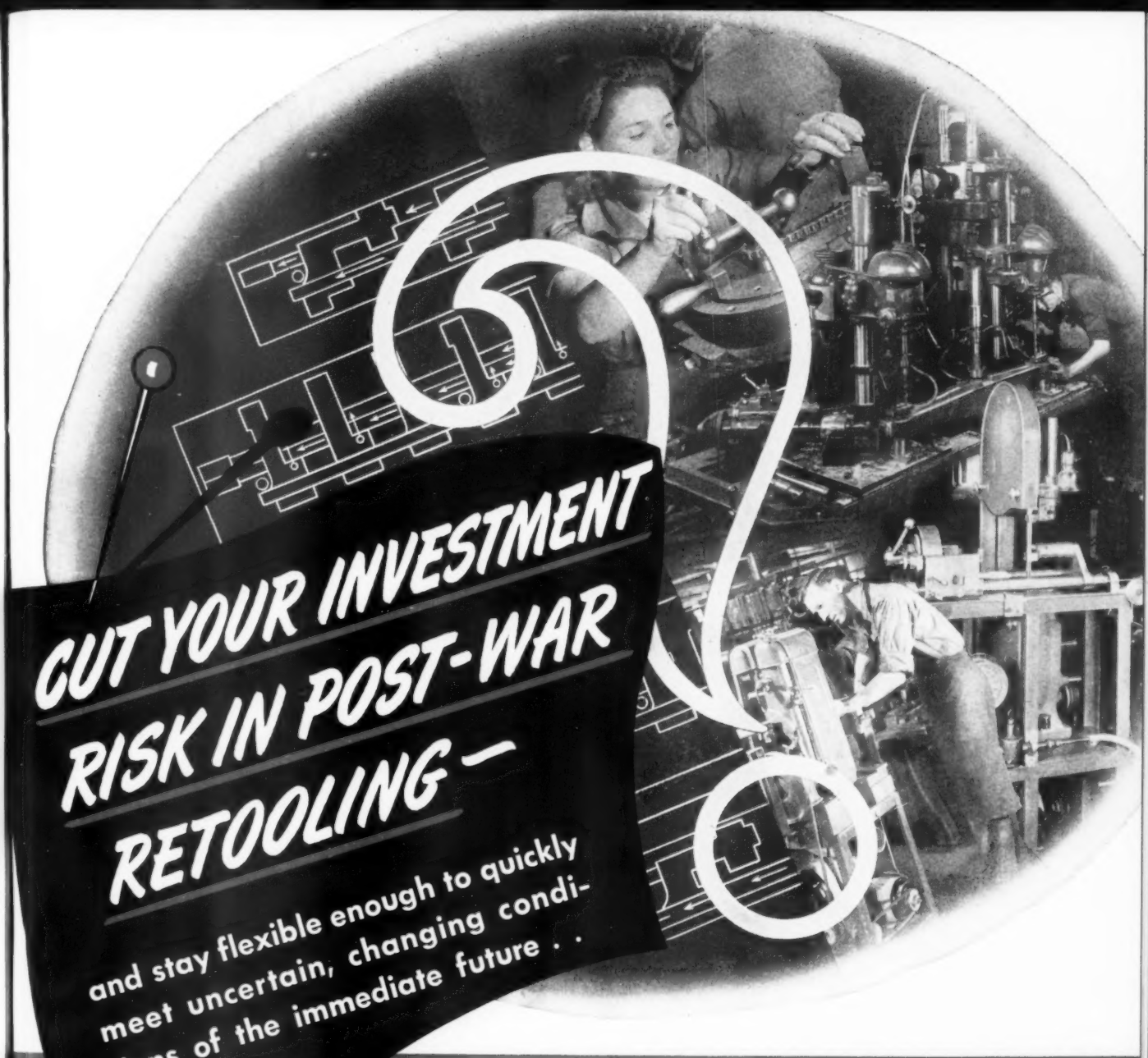
IF IT'S ***AUTOMATIC***
SEIFERT can build it . . .



This machine—designed and built by SEIFERT—automatically winds Nichrome wire on edge into spirals for induction heating elements. It typifies one of the many automatic machines SEIFERT has made for leading manufacturers here and abroad.

If you have a problem involving automatic machines—call on SEIFERT.

E. R. SEIFERT, Inc.
SYRACUSE, N. Y.



CUT YOUR INVESTMENT RISK IN POST-WAR RETOOLING—

and stay flexible enough to quickly meet uncertain, changing conditions of the immediate future . .

...with low-cost, high-production

Delta-Milwaukee Machine Tools

TURN THE PAGE!

In almost every department of your plant:

- ✓ Parts Production
- ✓ Assembly
- ✓ Tool Shop
- ✓ Maintenance Shop
- ✓ Foundry
- ✓ Pattern Shop
- ✓ Shipping Department
- ✓ Laboratory

— on a wide variety of applications in working metals, plastics, wood, and other materials . . .

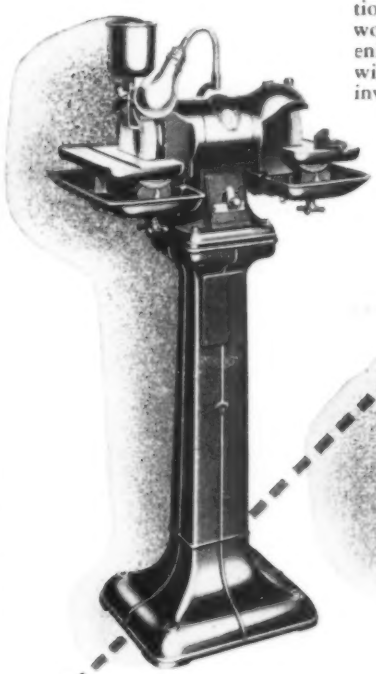
War production

maintain volume

. . . when you tool up

Delta Carbide Tool Grinder

Combined with the Delta standard tool grinder for hogging down the shank steel, this vibrationless unit gives you a perfect working combination for sharpening tungsten carbide tools, with a remarkably small initial investment.

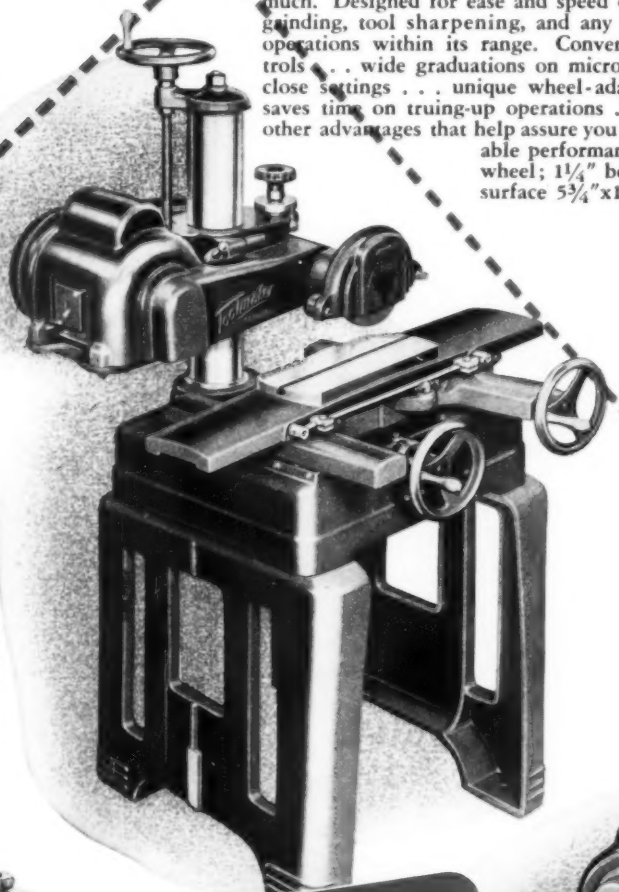


Delta Grinder with Twin-Lite Safety Shields

Your greenest apprentice can't forget goggles, when using this machine — safety glass shields are built right in! Both wheels are flooded with light, to assist accurate tool grinding. Easily-adjustable, machined tool rests.

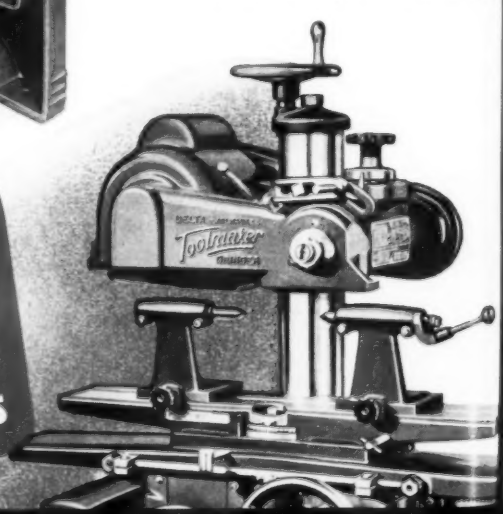
Delta Toolmaker Surface Grinder

Low cost and portability permit this husky, big-capacity grinder to be quickly swung into any spot to free machines costing many times as much. Designed for ease and speed of surface grinding, tool sharpening, and any grinding operations within its range. Convenient controls . . . wide graduations on micrometer for close settings . . . unique wheel-adapter that saves time on truing-up operations . . . many other advantages that help assure you of creditable performance. 7x½" wheel; 1¼" bore. Table surface 5¾"x13".



With the Univise, the first truly universal vise for grinding, drilling, and milling — and the coolant attachment—this machine serves as a dependable, accurate Chip-Breaker Grinder for grinding the chip-breaker groove on carbide-tipped tools. Holds the tool at any conceivable angle — accurately reset at a moment's notice.

With the Unihead, and the tool and cutter grinder attachment, this machine becomes the latest development in Tool and Cutter grinding. Simple, accurate, and very low in cost. Delta construction features assure perfect alignment and freedom from play. Substantially built and machined to very close tolerances.



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experience proves that you can

and quality . . . with big savings

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tool and
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Delta 14″ Metal-Cutting Band Saw

Saves time and money on many general tool and machine shop operations—sawing off tool, die, and fixture stock; cutting templates and similar tools; cutting almost any material from carbon steel to asbestos.

Delta 6″ Abrasive Belt Finishing Machine

Reduces cost per unit for precision finishing, polishing, edging, burring of small parts. Completely flexible in operation—can be set vertically or horizontally. Has lubricated-for-life ball bearings and other quality features.

NEW!

Delta Super-Hi-Speed Drill Press

. . . a low-cost 14″ machine for precision small-bore operations

Here's a new drill press that is interchangeable with the standard Delta 14″ model on the regular 14″ drill press column. It has all the famous quality features of Delta-Milwaukee Machine Tools — plus special refinements necessary for small-bore drilling of plastics, aluminum and other light non-ferrous metals: 60 cycle motor, with three-step pulley, permitting speed range of 12000 . . . 8100 . . . 5000 R.P.M. Movable motor mounting plate, to adjust belt tension. Specially-selected Jacobs chuck with drill capacity of from .025″ to ¼″ Spindle travel of 2¼″. Head, complete with motor, available separately.

Write for free, descriptive bulletin.

Consult your Delta-Milwaukee distributor regarding priorities and deliveries on these machine tools.

Delta Floor-Type Multiple-Spindle Drill Presses

4-spindle model illustrated. 2-spindle model also available with one-piece table. Floor types with sectional tables: 3-, 4-, 5-, 6-, and 8-spindle models.

Delta Power-Feed Drill Presses

Worm-driven power feed operates directly off motor — giving 8 rates of feed for each spindle speed. Instant switching from heavy power-feed operations to sensitive hand drilling. 17-inch single-spindle drill presses available in 24 different models.

Delta 14" Floor-Type Drill Press

Patented construction provides *both* a self-aligning drive and a free-floating spindle. Features include smooth-working table-raising mechanism, built-in depth gauge, safety belt guard, etc.

140 case histories of war production experience in

DELTA'S 76-PAGE BLUE BOOK

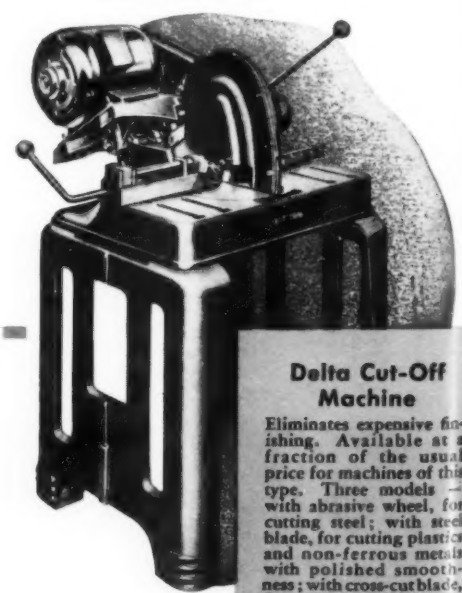
suggest money-saving peacetime applications in your plant

This book, sent to you without obligation, can help you more clearly visualize — and utilize — the versatility of portable, compact Delta-Milwaukee Machine Tools. • It may suggest—as it has in many cases — using regular stock-model Delta elements to build special-purpose machines that can be quickly converted to other uses when requirements change . . . or modernizing obsolete machines, by replacing worn units with standard Delta elements . . . or using low-cost Delta tools to quickly revise production-line layouts to get the best sequence of operations for increased man-hour output. • This modern way of retooling is practical, because your capital investment is held to a minimum. Delta cost savings are due to modern production methods applied to a large volume of standard models — not to short-cuts in quality. • Also available is a catalog of Delta-Milwaukee Machine Tools. Send for both books.

Use the coupon below.

These quality features minimize depreciation of your Delta-Milwaukee Machine Tools:

1. ***Double-sealed New Departure ball bearings*** are lubricated for life . . . double-protected against abrasive shop dust.
2. ***Pre-loaded bearings*** prolong bearing life, by eliminating unnecessary play between balls and races.
3. ***Precision-bored bearing seats*** assure true-running shafts that stay accurately aligned.
4. ***Balanced pulleys*** prevent the transmission of belt-vibration to spindle—thus reducing spindle wear.
5. ***Precision-ground shafts,*** ground to close tolerances, run true, smoothly, and without vibration.



Delta Cut-Off Machine

Eliminates expensive finishing. Available at a fraction of the usual price for machines of this type. Three models — with abrasive wheel, for cutting steel; with steel blade, for cutting plastics and non-ferrous metals with polished smoothness; with cross-cut blade, for cutting wood.

THE DELTA MANUFACTURING CO.
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Please send my free copy of the 76-page Blue Book, and catalog of low-cost Delta-Milwaukee Machine Tools.

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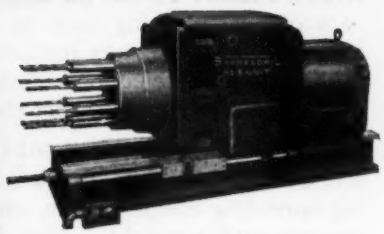
Tear out this coupon and mail *TODAY!*

any BARNESDRIL

Whether your drilling requirements involve light and medium, heavy-duty or progressive drilling, you can do the job at a saving by using the proper machine from the BARNESDRIL line of standard drilling machines. Standard BARNESDRIL machines can be adapted to most special drilling applications and each is designed to increase production and reduce operating costs.

For light and medium drilling, requiring capacities of 1″ to 2″ in steel, make your selection from single and ganged BARNESDRIL Self-Oiling, All-Geared Machines. BARNESDRIL Hydram machines, available in single-spindle, ganged and multiple-spindle arrangements, are ideally suited for heavy-duty work.

Progressive drilling, calling for drilling, reaming and tapping operations in sequence, can be most economically accomplished on BARNESDRIL All-Geared, Hydram and Hydraulic Production Drilling Units. Units can be arranged in any horizontal, vertical or angular position on work requiring capacities of ½″ to 4″ in steel.



BARNESDRIL Standard Hydraulic Units . . . for Special Operations. These standard units can be combined in any vertical, horizontal or inclined grouping to produce a special production machine for many drilling, tapping, reaming, boring or facing operations. Available with multiple-spindle heads, as shown in the illustration at the left, they provide definite savings in machining time. Bulletin 150-A.

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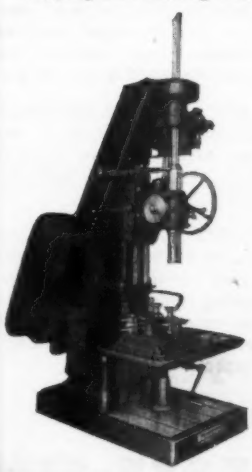
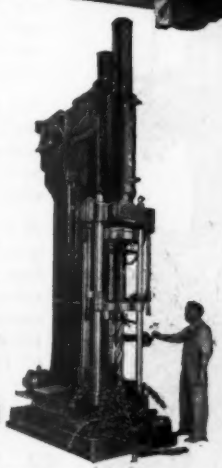
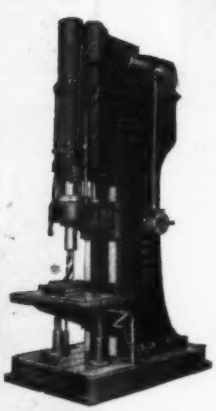
Send today for your free copy of Catalog A, including data every production man needs on the complete BARNESDRIL line of Drilling, Tapping and Honing Machines.



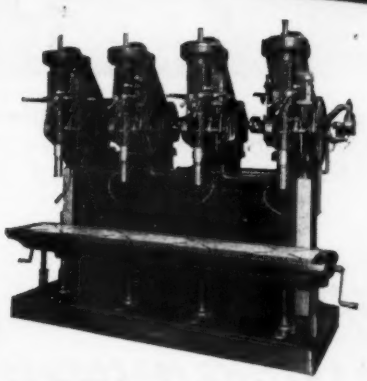
BARNESDRIL No. 262 Sliding Head Machine.



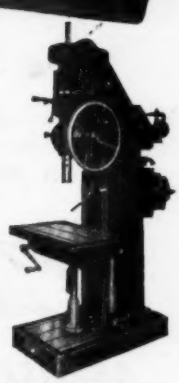
BARNESDRIL No. H-4 Hydram Inverted Drill.



BARNESDRIL No. H-4 Hydram Machine.



BARNESDRIL No. 242 Box Column; Spindle Gang Drill.



BARNESDRIL No. 201¼ Square Column Drill.

830 CHESTNUT STREET

Barnes Drill Co. ROCKFORD ILLINOIS, U. S. A.

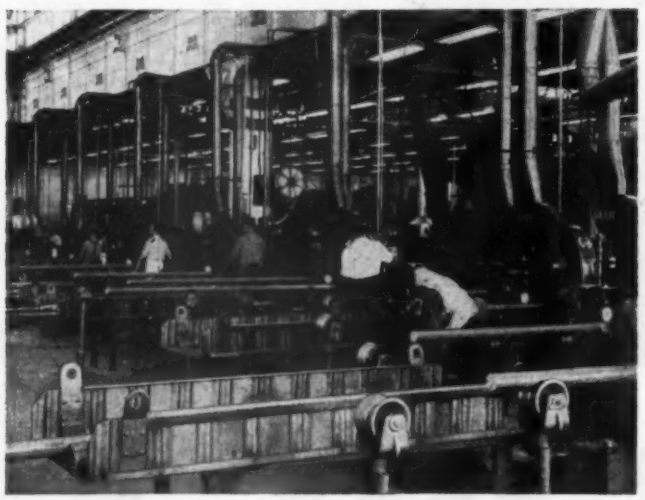
PRODUCTION UP! REJECTIONS DOWN!

Another PROBLEM SOLVED

THE PROBLEM: To cut off slugs from 2¾" diameter bars of heat-resisting steel to be used for making aircraft valves. Former method caused fractures in the metal—high rejections—failures in service. Necessary to anneal stock before cutting.

THE SOLUTION: Campbell 401 Cutamatic Wet Abrasive Cutting Machine. Stock is cut unannealed (saving annealing cost). Cut in one-fourth time. Slugs are cut within weight limits—have square ends for easy extruding.

AND SO . . . as production requirements grew, more Campbell machines were added. Now there are 32 on this job.



Your production problem may be totally different from this one—yet Campbell may be able to help you solve it. We'll be glad to talk it over with you.

Campbell

ABRASIVE CUTTING MACHINES

ACCO ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE • BRIDGEPORT, CONN.

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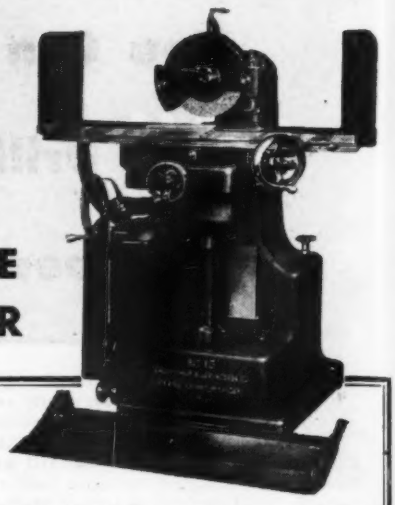


. . . a rugged machine for fine, accurate work

This high grade, motor driven machine will handle all work within its capacity with maximum convenience. Among the features which assure fine, accurate work and long precision service are the following:

. . . heavy, one-piece column and base
. . . precision ball bearing spindle
. . . careful guarding of wearing surfaces
. . . provision for wet grinding

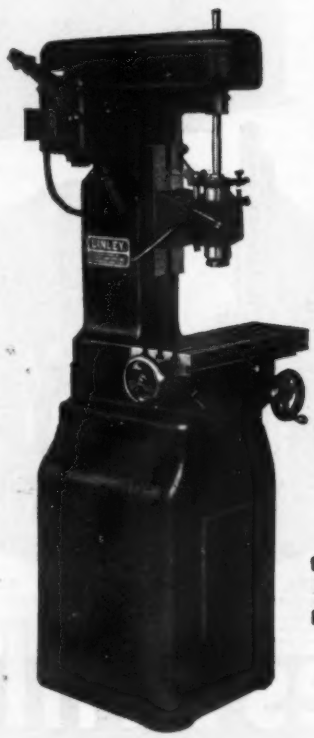
This machine can be furnished with coolant system or dust collecting system.

Longitudinal Table Movement—19"
Transverse Table Movement—8½"
Vertical Movement—12"
Table—6"x18"

Send for illustrated literature giving further details.

GALLMEYER & LIVINGSTON CO.
330 Straight Street, Grand Rapids (4), Mich., U. S. A.

QUICK SET-UPS save TOOLMAKERS' TIME



The mechanical design of the LINLEY vertical Milling and Jig Boring machine facilitates quick set-up and easy changeover. Its high speed and accuracy on small die making jobs, models, metal patterns and the usual machining operations of busy toolrooms make it a definite asset in any shop.

You save your larger machines for their rated capacity, save toolmakers' time, cut costs, speed the work . . . use but 18½"x20" floor area.

FEATURES: Choice of 8 spindle speeds to 4250 r.p.m.; anti-backlash quill travel; direct micrometer measuring device; velvet feed; grease-sealed bearings; 7"x17½" table top. A premium machine in all respects.

ASK FOR BULLETIN

LINLEY

BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

ELIMINATE WHEEL FORMING

SAVE TIME AND MATERIALS

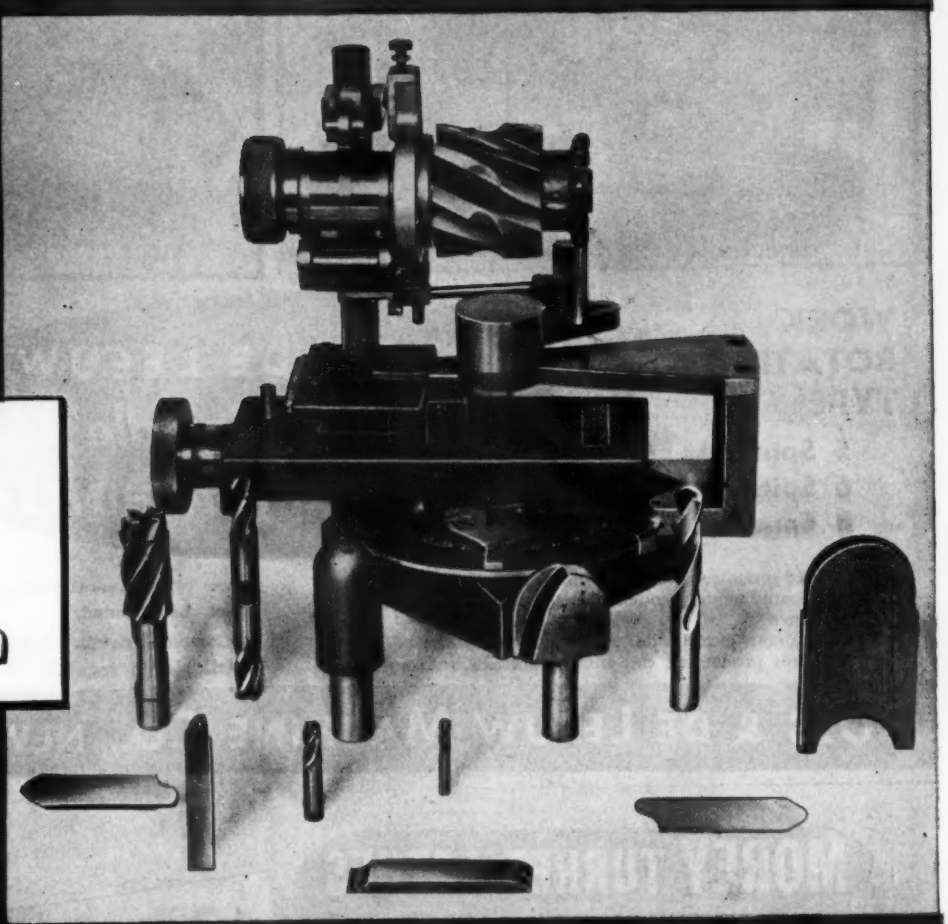
*

SPEED PRODUCTION

MEYERS

Radiform

TRADE MARK REG.



GENERATES CUTTING TOOLS TO ACCURATE TOLERANCES

The Meyers Radiform is unlike any other machine on the market in that it is adaptable to so many different grinding operations. Predetermined radii can be *accurately* generated on tool bits, milling cutters, end mills, drills and die sinking tools in less time than by any other method. *Speed, accuracy* and *versatility*—a combination that makes the Radiform indispensable in any shop. Discover what Radiform can do for your shop. Write or wire today for complete descriptive literature and prices.

W. F. MEYERS COMPANY, INC. • *Established 1888*

1022 FOURTEENTH STREET • BEDFORD, INDIANA

Clip AND MAIL THIS COUPON TODAY!

W. F. MEYERS COMPANY

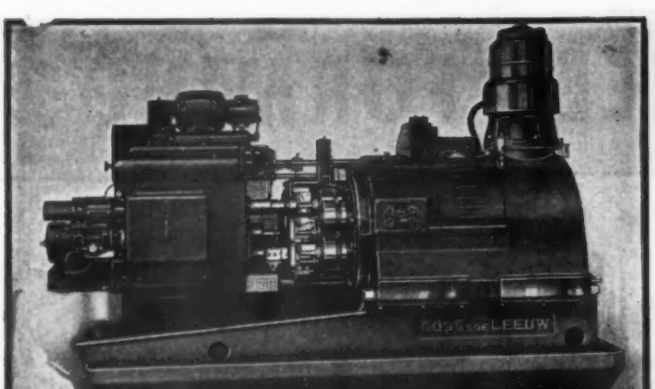
1022 Fourteenth Street, Bedford, Indiana

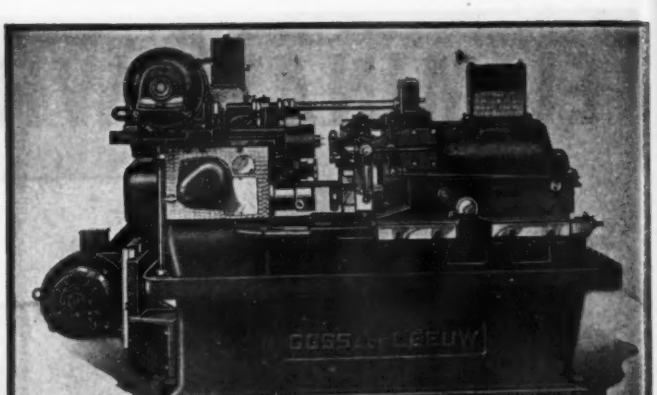
Please send catalog and price list on Meyers Radiform Wheel and Tool Former.

Company _____

Address _____

Name _____ Title _____





WORK ROTATING TYPE

- 5 Spindles
- 6 Spindles
- 8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

- 4 Spindles
- 5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

MOREY TURRET LATHES

for BAR *or* CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM.
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

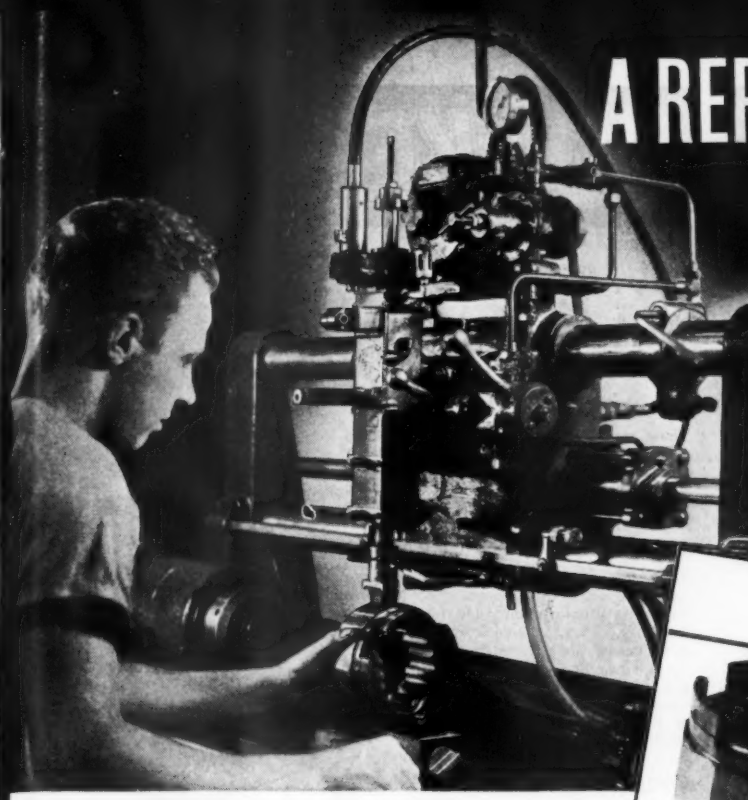
EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

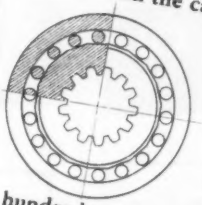
DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK



A REPORT To Manufacturers Who Want More Facts on How *Superfinishing* Can Improve the Performance of Their Products...

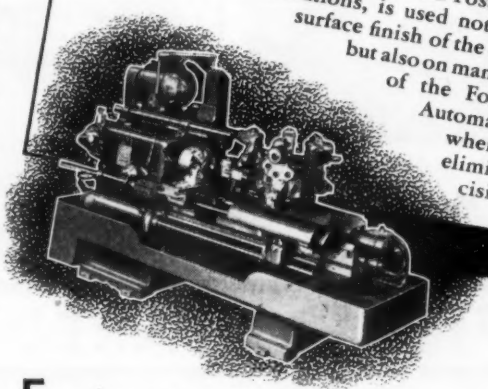
— CASE REPORT —

THE PART:
This cam is the driven member of an over-running clutch used in Foster Fastermatic Turret Lathes. Any scratches or surface imperfections on the cam lobes, no matter how slight, could cause faulty operation or outright failure of the clutch due to the pressure exerted on the cam lobes by the clutch rollers.



THE CLUTCH:
Superfinishing all 18 lobes of this cam removes all scratches and metal fragments, providing a geometrically accurate surface within 2 to 5 micro inches. Thus all risks of operational failures are removed—in fact, of the hundreds of these clutches in use, not one has developed any operational faults since Superfinishing has been used.

THE MACHINE:
Superfinishing, a process to which Foster engineers have made major contributions, is used not only to improve surface finish of the cam shown above but also on many other vital parts of the Foster Fastermatic Automatic Turret Lathe where wear must be eliminated, high precision maintained.



Why Superfinishing Provides Smooth, Trouble-Free Operation for any product...

You improve the performance of your product in these 4 important ways when you adopt Superfinishing to remove surface imperfections:

1. **Eliminate Tedious Run-in Periods**
2. **Eliminate Bearing Wear and Adjustment**
3. **Eliminate Frictional Drag and Heat**
4. **Eliminate Vibration and Chatter**

Basically Superfinishing is a revolutionary new metal finishing process which generates surfaces geometrically accurate to within 2 to 3 micro inches, measured by a profilometer, with not to exceed .0002" stock removal. It is used after finish grinding or machining operations to eliminate such common surface defects as: ridges produced by turning tools; grinder feed spirals, chatter marks and flats; metallurgical changes in surfaces caused by grinding heat and surfaces marked by partially loosened particles caused by the violence of metal removal.

By producing surface finishes not obtainable by any other method, Superfinishing makes possible greater dependability and trouble-free performance in vital parts of any product just as in the case of the clutch part reported here.

LEARN HOW SUPERFINISHING CAN BENEFIT YOUR PRODUCTS

To determine how Superfinishing can improve the performance of your products, or those you propose to manufacture in the post-war period, consult with Foster Superfinishing Engineers on the proper applications of the process to your machining and design problems. Their recommendations are available without obligation.

Facts about this job...

Material—Steel forging, S.A.E. 8720, hardened to Rockwell 64.

Profilometer Readings—Before Superfinishing, 18 to 20; after Superfinishing, 2 to 5 micro inches.

Stock Removal—13 to 15 micro inches.

Production—Time to finish all 18 cam lobes, 15 to 18 minutes.

Machine—Foster General Purpose Superfinisher size 4 inches by 18 inches.

FREE SUPERFINISHING DATA BOOK

Send for your free copy of this valuable data book explaining the Superfinishing process and its many uses and advantages. Here, also, are illustrations and specifications of Foster Superfinishing Machines. Write to Foster Division, International Detrola Corp., 1100 W. Beardsley Ave., Elkhart, Indiana.

INTERNATIONAL MACHINE TOOLS

Foster Division - Elkhart, Indiana

INTERNATIONAL DETROLA CORPORATION

DETROIT, MICHIGAN • ELKHART, INDIANA • INDIANAPOLIS, INDIANA

FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS • SUPERFINISHING MACHINES • SPECIAL MACHINE TOOLS

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

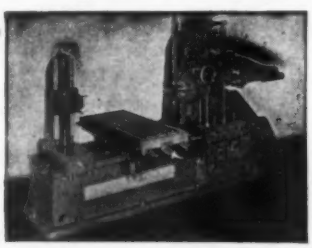
Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT • • • OHIO

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

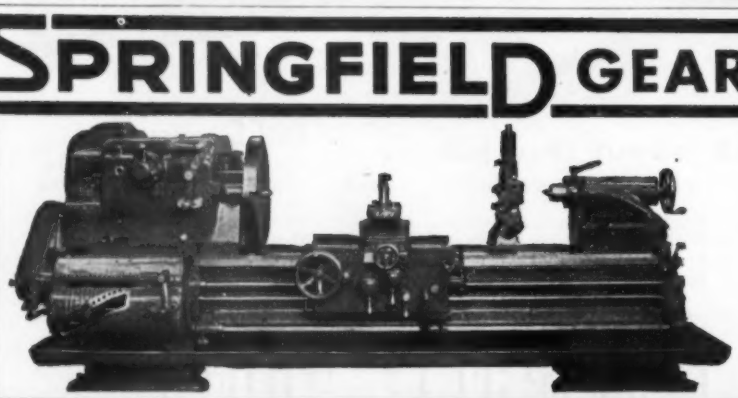
HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

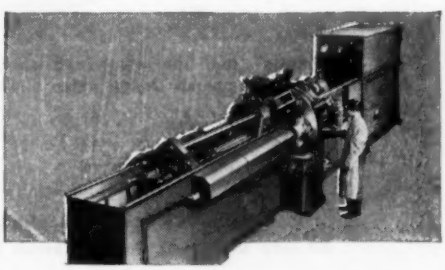
A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

WHAT HAS THIS TO DO WITH BROACHING?

THROUGH the high, fog-shrouded passes of the dread Himalayas, the C-47's, "pack-mules" of the Army Transport Command, fly vital supplies into besieged China. Unarmed, they fly "blind" through the worst of weather conditions on instruments that utilize the principles of centrifugal force. Although centrifugal force had existed as a natural phenomena since the beginning of Time, and David had used its force to slay Goliath, it remained for Galileo to chart its principles. Watching the slow, measured swinging of the cathedral lamp at Pisa, his observations opened up vast new horizons in the field of horology, leading logically to many of today's precision instruments and fine timepieces.

FOLLOWING a similar pattern of progress, the principle of broaching — revolutionary in its theory and limited in its uses only half a century ago — has developed into a modern industrial miracle, mass-producing an almost unlimited variety of parts to closer tolerances and with greater speed than any other known method of metal removal. Manufacturers who are planning for tomorrow are consulting Lapointe engineers today!



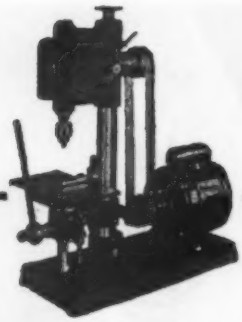
Lapointe HP-150 with revolving fixture, using two broaches to spline large, four-blade propeller hubs.

ARMY E NAVY

The LAPOINTE Machine Tool Company

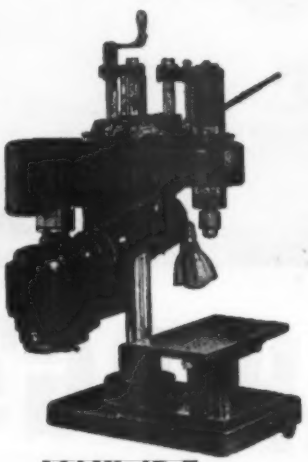
HUDSON, MASSACHUSETTS, U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES



HAMILTON MUEHLMATT SENSITIVE TAPPER

A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.

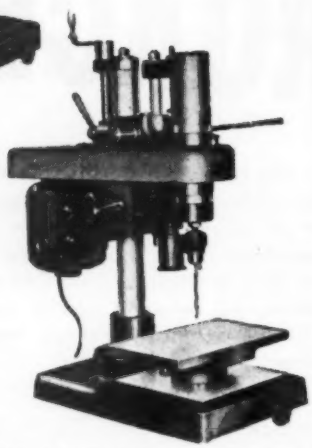


"VARIMATIC"

Built with instrument precision allows instantaneous variable speed adjustment in two ranges. Low range 840 — 270 R.P.M. High range 2900—9300 R.P.M. Drill capacity .004" to 5/16".

MAXI-JR-E

Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self contained drilling unit which swings radially on the column and may be locked in any desired position. This extremely flexible small drilling machine may be ganged for sequence operations or to increase production. Spindle speeds from 750 to 8,750 R.P.M.



The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

•

Write for full particulars on any or all of the machines shown.

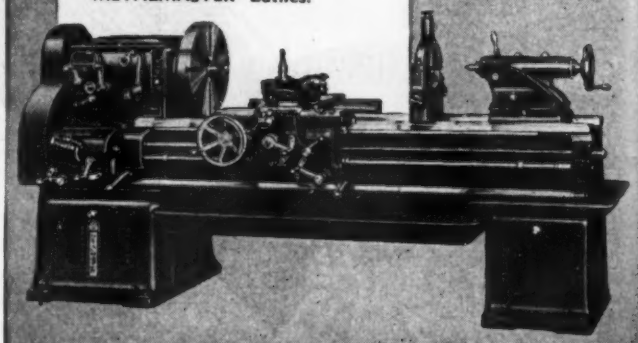
The Hamilton Tool Co.

830 NINTH ST. HAMILTON, OHIO

Metalmaster

12", 14" & 16" LATHES

• Fast, accurate for war production . . . durably constructed, precision built to meet peacetime manufacturing needs. Write for catalogs describing in detail the advantages of METALMASTER Lathes.



The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers

ROCKFORD, ILLINOIS, U. S. A.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

No. 1G	INTERNAL GRINDER	No. 34	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	No. 3B	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.

EAST PROVIDENCE 14, RHODE ISLAND

Let DoALL do all your FILING

METALS • ALLOYS
PLYMETALS • LAMINATES
PLASTICS

Cast Steel Wrenches filed in 3½ minutes each. This is one of hundreds of jobs handled the DoALL way, which is 9 times faster than hand filing, 4 times faster than jig filing.

For occasional important file jobs, just slip a DoALL File Band on any DoALL Contour Machine and you're instantly ready to do the finest, fastest, smoothest filing —both internal and external work. Operates with a steady, one-way stroke that makes filing easy. Files wear evenly and last longer.

If, however, your Contour Machine is too busy cutting and shaping, the DoALL Band Filer is just what you need. Occupies 27"x34" floor space and files to close tolerances, anything up to 6" thick.

12 AVAILABLE FILE BANDS — Lengths to fit any DoALL Contour Machine or Band Filer.

Write for Circular
BAND FILING TO PRECISION TOLERANCES

DoALL

INDUSTRY'S NEW SET OF TOOLS

CONTINENTAL MACHINES, INC.
1310 S. Washington Ave. • Minneapolis 4, Minn.

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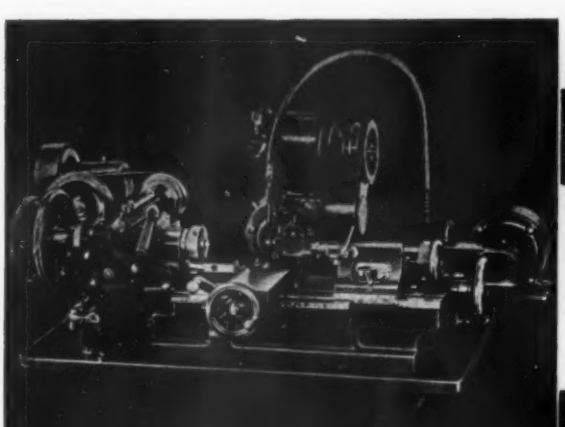
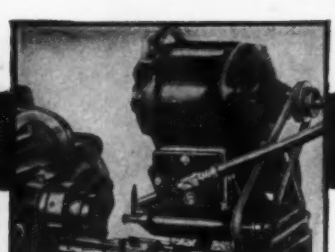
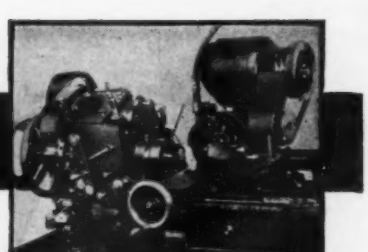




Machine equipped with Internal Threading Attachment having special motor driven cutter head.



Machine equipped with Relieving Head. Lead screw is replaced by a special work head.

WALTHAM THREAD MILLERS

Produce standard and special thread forms with utmost precision and speed

These versatile machines will produce V, N, Whitworth, Buttress and other thread forms accurately and at a high rate of production. Regardless of the type of thread, convenience, speed and high precision are definitely assured.

The capacity of these machines is such that precision threads and small worms can be produced up to 2" in diameter. However, they will swing pieces as large as 3" diameter. They can be furnished for single or multiple cutter use.

An important feature is the use of three motors — for speed, feed and oil respectively — which permits individual speed change and reverse for both cutter and work and a constant speed for the pump. All motors are controlled from a single start and stop station.

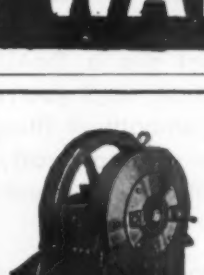
• • •

Write for Bulletin 244A

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

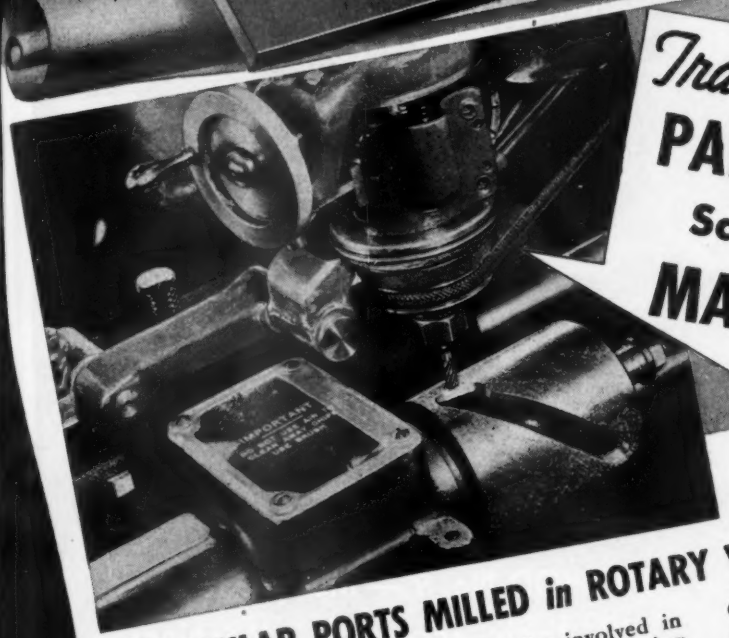
The
CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING



Tracer Controlled PANTOGRAPH Saves Critical MAN HOURS

Typical HIGH PRODUCTION JOB for 1000 HP. Diesel Engines

IRREGULAR PORTS MILLED in ROTARY VALVES . . . in 30 Min. Each

This manufacturer solved the difficulties involved in milling irregular shapes in cylindrical parts by placing the job on a Gorton Tracer-Controlled Pantograph, equipped with a Gorton Roll Attachment, enabling use of only a simple, FLAT Master.

Specifications called for cutting highly finished ports in these Rotary Valves of nickel steel tubing, 7/32" thick. The required rough, semi- finish and finish cuts were completed in 30 minutes per Valve, Floor-to-Floor Time. Port was first roughed with 3/8" dia. 4-flute spiral end mill. For the semi-finish operation, tracer and cutter were changed to 1/4" dia. Finish cut necessitated only a change in tracer style. To prevent chatter marks and insure the fine finish demanded, only .002" to .003" of stock was removed in the finishing cut.

GORTON ENGINEERING SERVICE, FREE. Submit your milling problems like these to Gorton Engineers. Use their specialized experience in Tracer-Control Milling to solve your problems—recommendations made without charge or obligation. Send part or print and specifications to your nearest Gorton Dealer, or direct to the Gorton Factory at Racine, Wis.

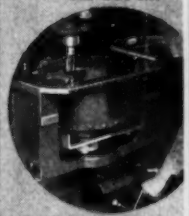
Gorton Tracer-Controlled Machines simplify difficult operations like this, because they are quickly set up, and easily operated with less skilled labor than by other methods. Tracer-Control assures uniform accuracy. The versatile Gorton Roll Attachment permits milling or engraving of continuous designs, completely around rolls, tubes, etc. For further information, send for both Bulletins offered below.

JOB IN BRIEF . . .

PART—Valve.
OPERATION—Rough, Semi-Finish and Finish Milling of irregular-shaped port in Valves.
MACHINE—Gorton 3-Z Pantograph.
ATTACHMENT—Gorton Roll Attachment 750-1.
CUTTERS—3/8" and 1/4" four-flute, spiral, end mills.
MATERIAL—Nickel Steel tubing, 7/32" wall thickness.
PRODUCTION—30 minutes per Valve, floor-to-floor.
FINISH—Exceptionally smooth.

The Right Size The Right Type of Machine for Every Job . .

From 2 oz. to 2 ½ DIE BLOCKS



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GORTON Precision MACHINES

CUTTER GRINDERS
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Avey Automatic METHOD No. 9

THE Avey CAM FEED UNIT

No. 1 Size—1/2" capacity in cast iron.

No. 2 Size—7/8" capacity in cast iron.

CENTER COLUMN TYPE MACHINE

designed for multiple operation on two faces of work, where work includes too many holes or operations to be performed by center rotating table methods: (drilling—reaming—tapping).

METHOD No. 9 — Multiple tooling with tools accessible. Machines usually furnished in pairs, or with double fixtures at each indexing position, so that top and one side of work can be presented at one time, while bottom and opposite side can be presented in second position or on second machine.

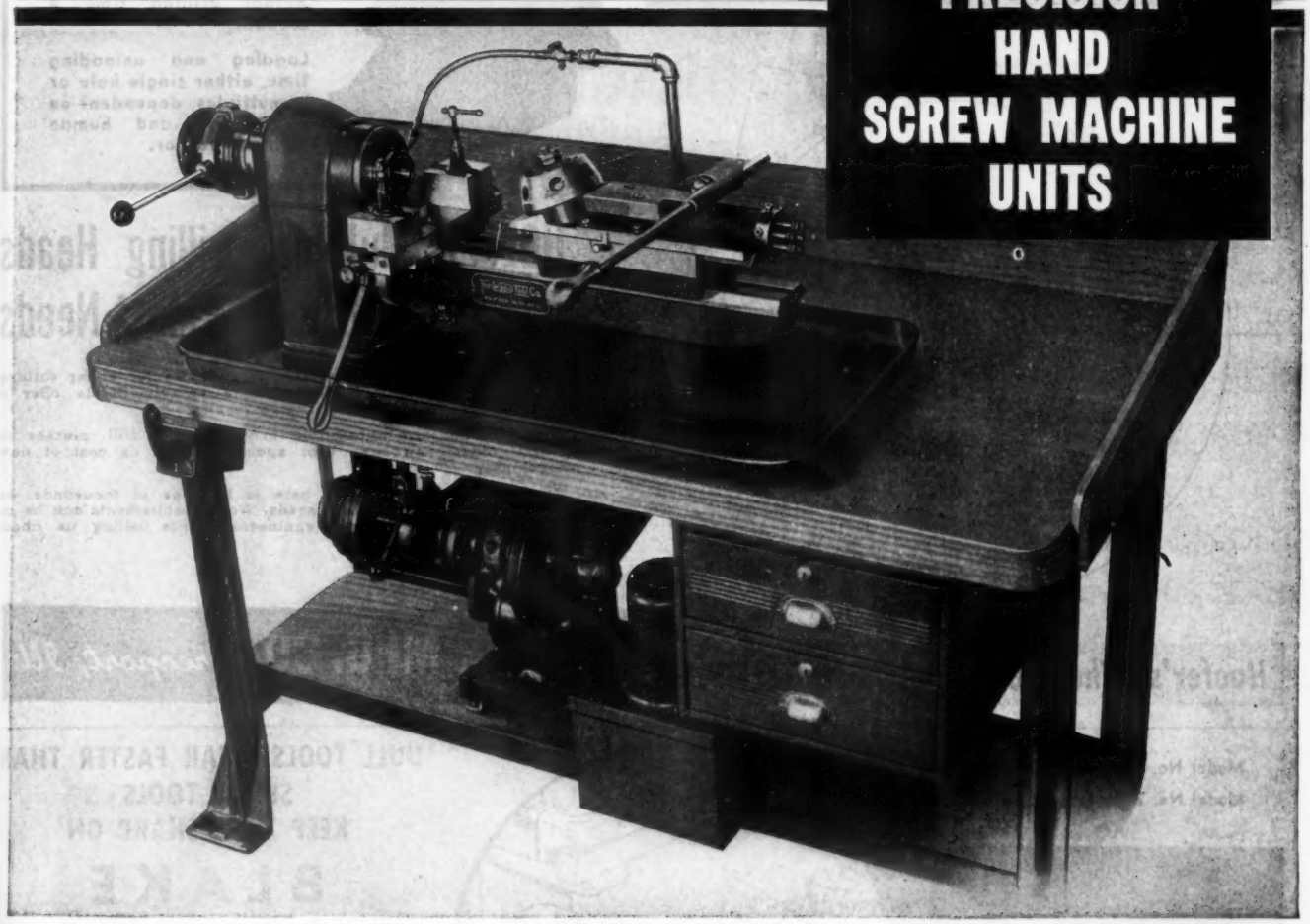
THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

Write for operation sheet M-9 for details.

Avey DRILLING MACHINES

You Can Get The Work Out With These Versatile, Wade Standard

PRECISION HAND SCREW MACHINE UNITS



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Bench Lathes and Profilers For Precision, Versatility And Stamina

Wade Standard Precision Hand Screw Machine Units get the work out . . . they're built for precision production operations. • Headstock has double row roller bearing. • Lever Closer runs on ball bearing; operates positively to open or close collet with instant movement. • Double Cross Slide movement 2¾"; provided with adjustable stops. • Automatic Turret Attachment; Tilted self-clamping 6-station head; takes ¾" shank tools; Adjustable stops index automatically. • Turret working travel 3¼"; indexing travel 1"; total 4¼". • Unit has 32" bed. • Collet cap: Model #5, ¾"; #7, 1". • Weight, net: #5, 172 lbs., #7, 184 lbs., with laminated maple top steel bench, approx. 660 lbs.

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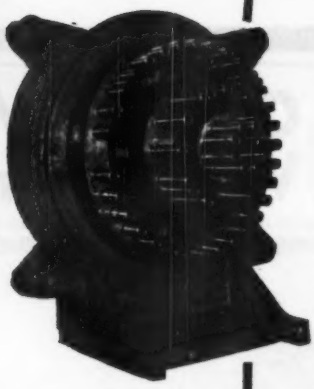
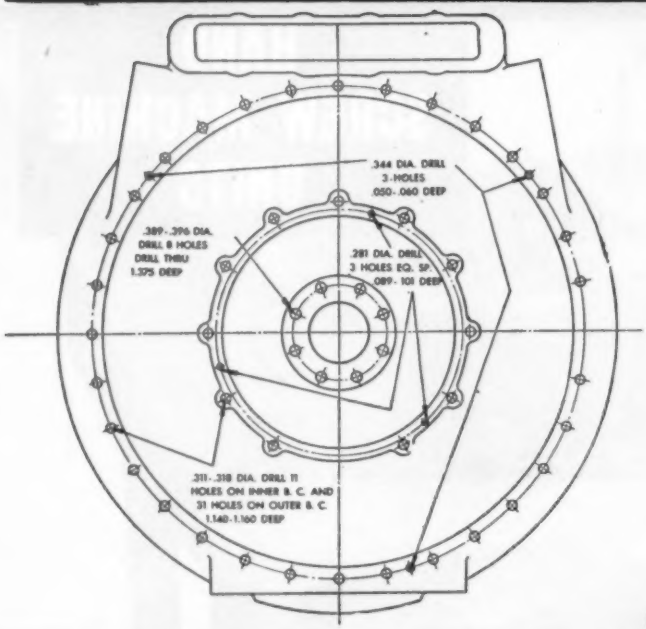


Supercharger Rear Housing

56 holes as per layout . . . Magnesium 1408 feet per minute—1700 r. p. m.—.006" feed—10.2" penetration per minute.

Actual drilling time 8 seconds.

Loading and unloading time, either single hole or in multiples, dependent on jig design and human element factor.



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★ **Where holes can be worked in multiples for either drilling or allied operations Hoefer Multiple Spindle Heads offer a simplified method with time saving results.**

Hoefer Heads are attachable to your own drill presses or turret lathes—you save floor space as well as cost of new machinery.

The Hoefer Head featured here is but one of thousands we have developed for specific needs. Your requirements can be as easily developed by our engineers. Write telling us about your job.

Hoefer's Whole Business is Holes . . . .

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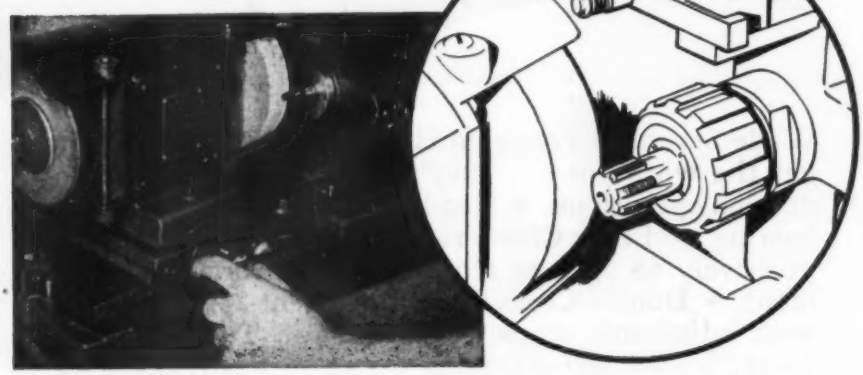
Model No. 1 for taps up to 6" long.
Model No. 2 for taps up to 14" long.



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KEEP TAPS SHARP ON

BLAKE TAP GRINDERS

Easily
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Economically

There is plenty of life in every tap when they are kept sharp on the chamfer with a Blake Tap Grinder. This machine is a real money-maker. It offers the chance of getting five or ten (or even more) times the life out of every tap than you are now getting. One user saved over $30,000 worth of taps on one machine in one year!

The Blake Tap Grinder will sharpen right- or left-hand taps with 2, 3, 4, 5, 6, 8, or 10 flutes—and unskilled labor can run the machine with speed and efficiency.

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Please send me Bulletin 544 which gives complete details on Blake Tap Grinders.

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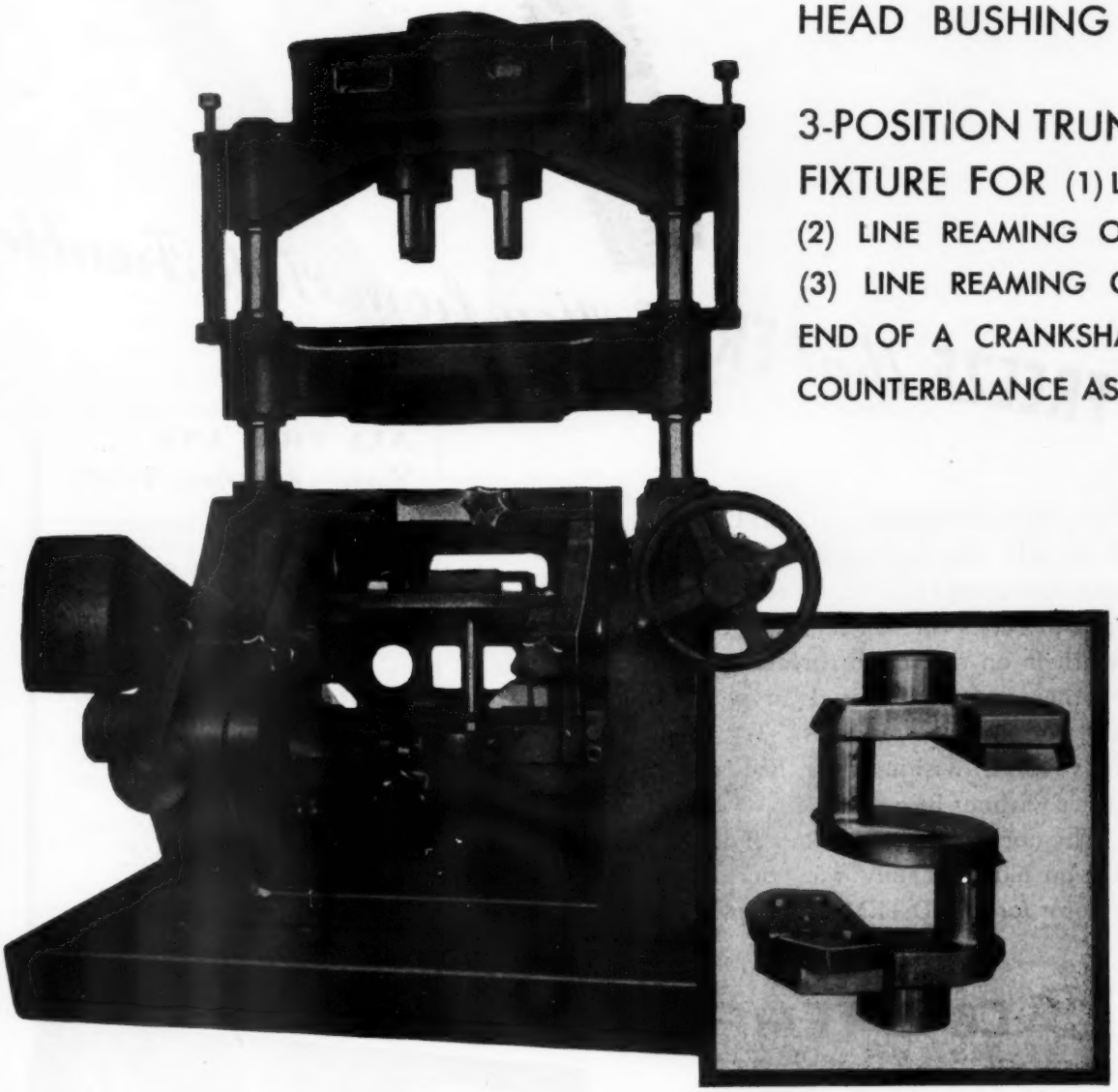
4-SPINDLE REAMER HEAD BUSHING PLATE

3-POSITION TRUNNION FIXTURE FOR (1) LOADING (2) LINE REAMING ONE END (3) LINE REAMING OPPOSITE END OF A CRANKSHAFT AND COUNTERBALANCE ASSEMBLY



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Try Threadwell COLD-TEMPER Taps. That's all we ask. See for yourself what this new deep-freeze treatment (120° below zero) means to you in terms of better threads and more of them per tap. Try them on the tough threading jobs — plastics or other abrasive materials as well as on steels, cast iron and other metals. Try them wherever you've been wishing you had taps that were harder without being brittle.

Why not find out what they'll do for you. They cost no more Simply ask your Threadwell Distributor for COLD-TEMPER Taps.

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2. **Threadwell Tap "i-dot-ification"** — *red* dot on the shank for high speed cut thread, *white* dot for commercial ground, *blue* dot for precision ground.
3. **Threadwell "Tap-Capsule"** — every ground thread tap in its individual transparent plastic tube for complete protection and instant identification before unwrapping.
4. **Threadwell greaseless rust-proofing** — clean and dry to handle, always ready to use.
5. **Threadwell Tap service** — **personal attention** to your tap needs at the factory and from your Threadwell distributor.

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SINCE 1902
"TAPS OF DISTINCTION"

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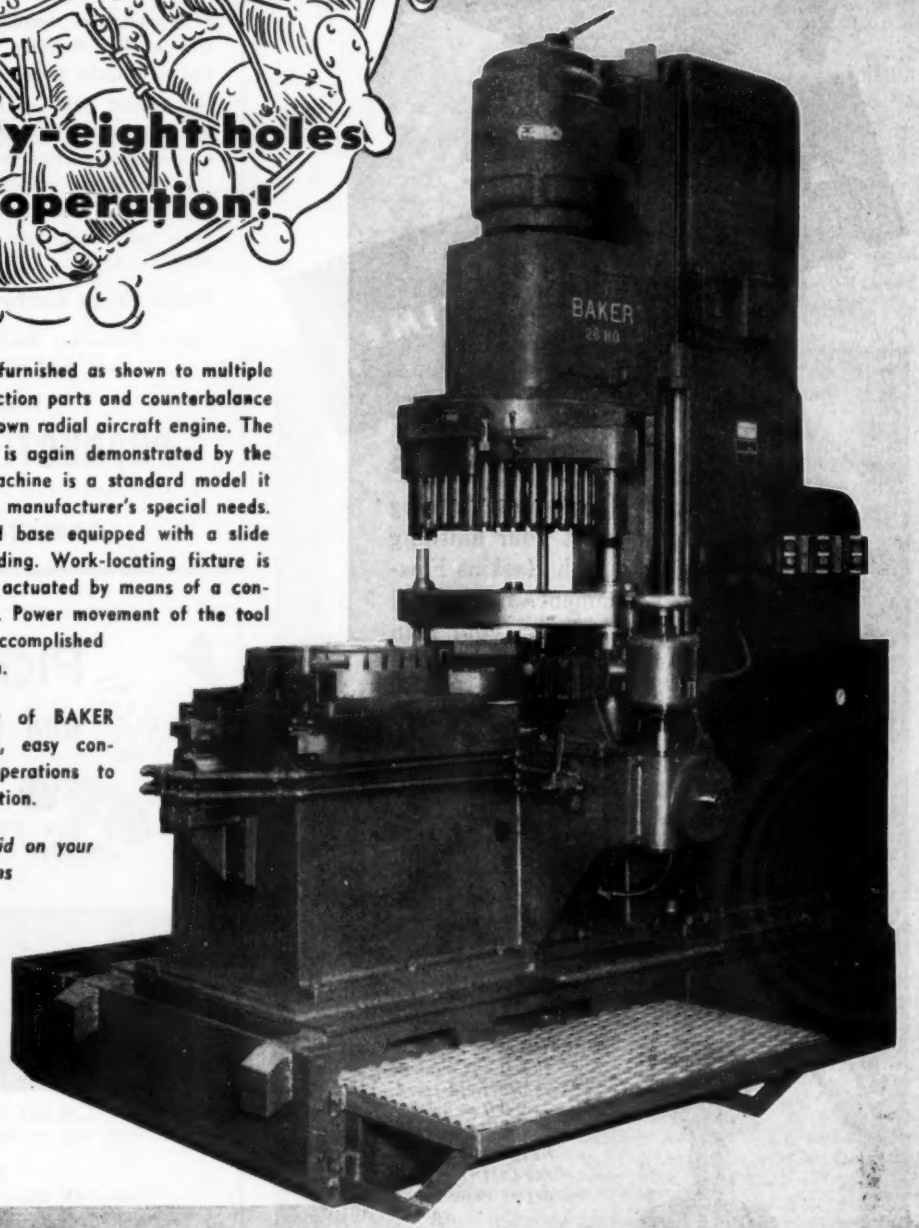
BAKER

Model 26-HO SPEEDS PRODUCTION OF RADIAL AIRCRAFT ENGINE PARTS

Drills thirty-eight holes in a single operation!



This BAKER machine was furnished as shown to multiple drill 38 holes in cam reduction parts and counterbalance supports used on a well known radial aircraft engine. The flexibility of BAKER units is again demonstrated by the fact that although this machine is a standard model it was easily adapted to this manufacturer's special needs. Note the special extended base equipped with a slide fixture to permit easy loading. Work-locating fixture is mounted on the slide and actuated by means of a conveniently located air valve. Power movement of the tool support bushing plate is accomplished with a push button station.

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TIME CANNOT BE SALVAGED

Once it's gone there's no reclaiming it. But you can cut your finishing time 'way down with Haskins Flexible Shaft Equipment. Forget old hand-finishing methods. Your men will work faster and better, with less fatigue, the Haskins way. Every hour will see increased production. Man-hours—plus machine-hours—will really mean something. For important new time-saver methods, send for your copy of Catalog 45. R. G. Haskins Company, 2760 W. Flournoy Street, Chicago, Illinois.

H-6

1/2 H.P. Countershaft drive, 4-speed —900—3400 R. P. M. Bench height pedestal mounting, 360 degree swivel.

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CENTERLESS POLISHING and FINISHING MACHINE

Handles both cylindrical and flat work—

By a quick and simple change-over, the Type S machine can be converted for use from a centerless feed cylindrical polishing machine to a machine for handling straight line finishing of flat or irregular work.

No special skill is required to assure fine work at a high production rate. It is ideal for polishing and finishing such materials as metal, rubber, fibre, wood, etc.

Note these features

Patent Centerless Feed for cylindrical work. Quickly removed feed mechanism. Full ball bearing equipped.

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Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

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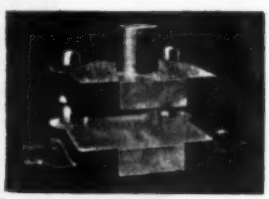

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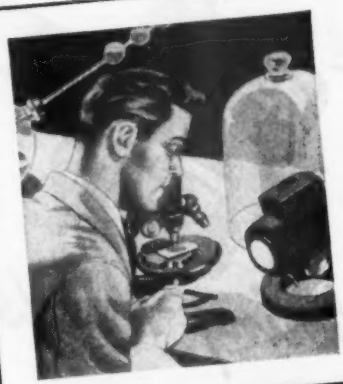
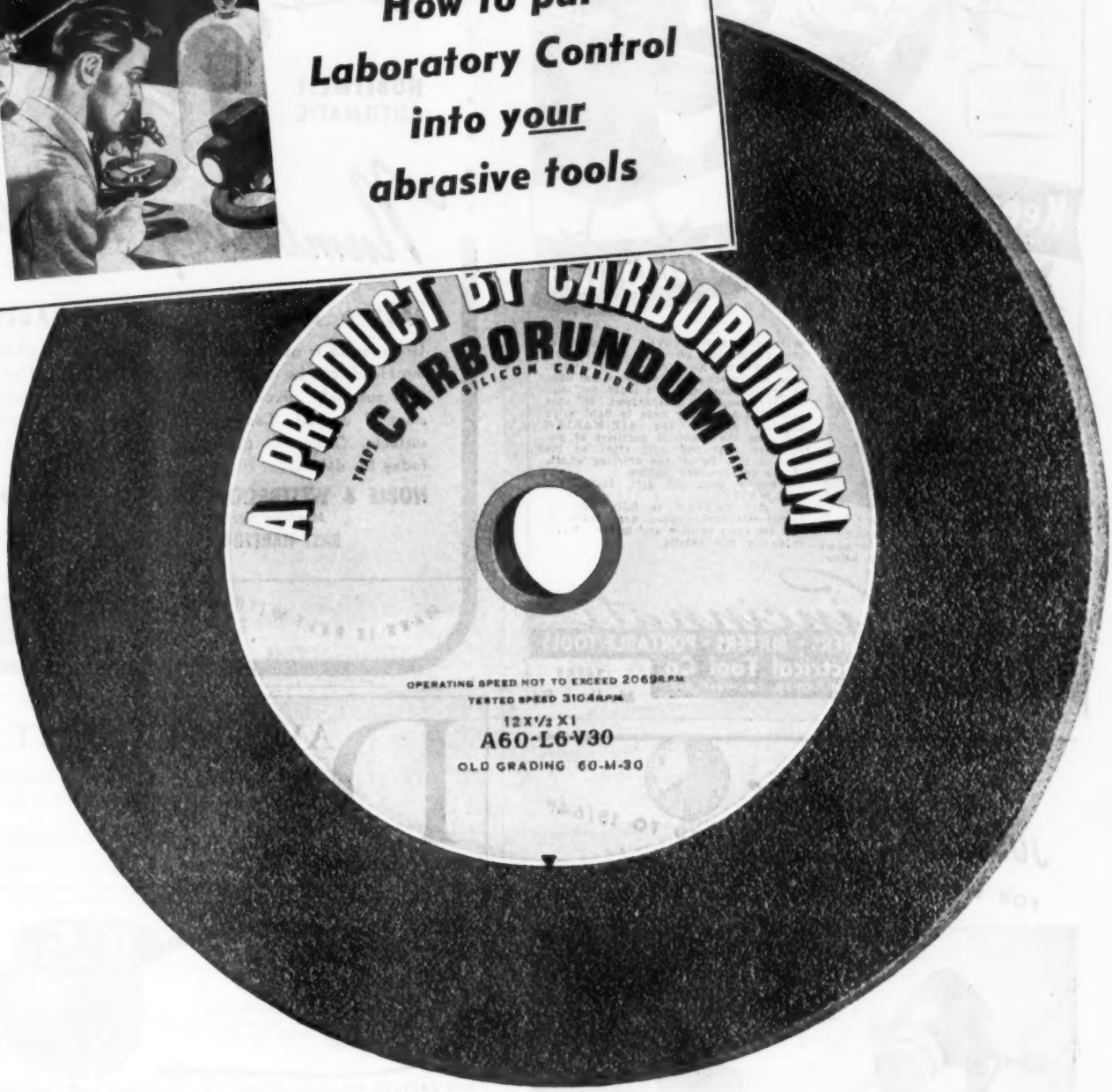


How to put Laboratory Control into your abrasive tools



ONE answer is to buy every type of Abrasive Tool from "CARBORUNDUM"! Each ingredient in every product by "CARBORUNDUM" undergoes carefully supervised laboratory tests. This testing assures rigid control of the standards established for quality and product uniformity. Thus, you are assured that each product possesses *all* of the properties essential to a dependable and efficient abrasive tool.

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Two, Three and Five H.P. grinders and buffers on AA-5 priority or better.

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The Cincinnati Electrical Tool Co.

DIVISION OF THE R. K. LEBLOND MACHINE TOOL CO. CINCINNATI, OHIO

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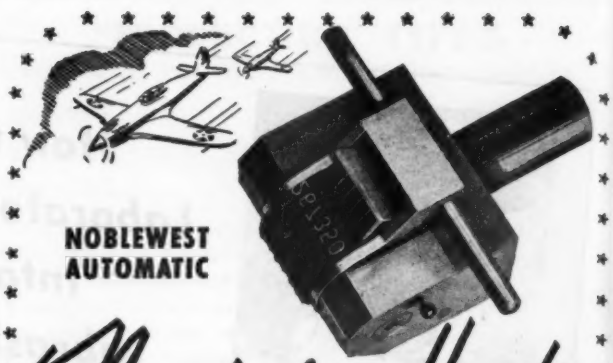

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Numbering Heads

FAST • ACCURATE • DEPENDABLE

Unsurpassed in quality, Noblewest Automatic Numbering Heads can be relied upon to number consecutively with automatic precision. Numbers may be kept constant if desired. Can be used on flat and round surfaces. Choice of number styles and sizes. Write today for details.

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FOR SMALL DRILLS FROM No. 70 TO 15/64"

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Famous for

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Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 209 Nov. 23, '44, American Machinist

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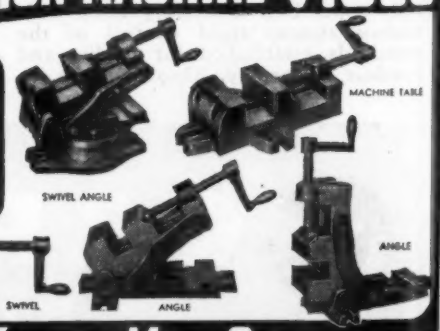

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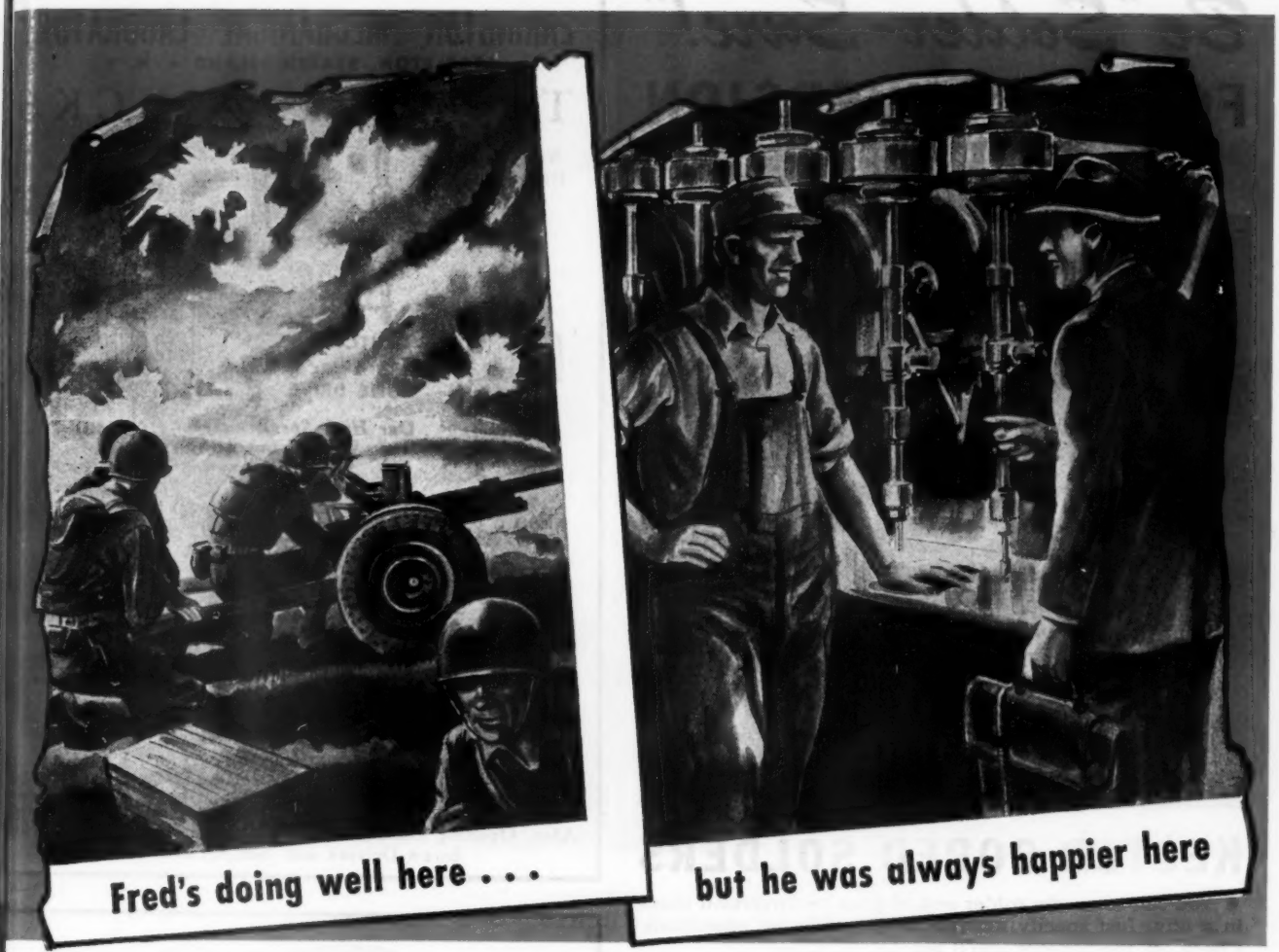

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✓ Kester's 46 years of solder experience—that gives you tops in quality and unvarying uniformity.

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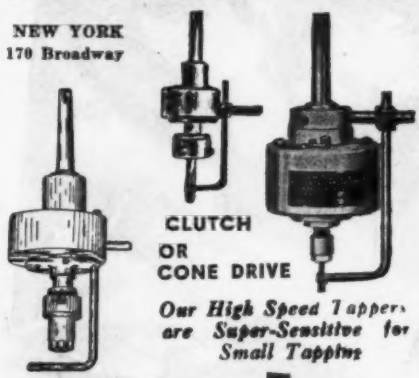

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Our High Speed Tappers are Super-Sensitive for Small Tapping

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Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder. If required.

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VERTICAL AND HORIZONTAL
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To the left is shown our new machine used for the upsetting of punches in place and used extensively in the die and tool department of stamping plants. On the right is shown our new machine for cap setting up to 90 mm caps. Fully adjustable for torque. These machines obtainable in vertical and horizontal types ¼ H.P.

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At the suggestion of a Behr-Manning field engineer, Garnet Paper as an abradent was tried with immediate and almost incredible improvement in both speed and economy.

In a hopper at one end of the machine, the nuts lie in their red hulls. The power is thrown on and almost instantly from the other end emerges a mixture of cleaned nuts and skins, whence a suction line whisks away the loose hulls, and the clean, white peanuts fall into a waiting receptacle.

The Garnet Paper involved costs six cents and cleans a ton of peanuts before it has to be changed.

You may not be interested in peanuts, but the same engineering skill and knowledge which enabled our man to contribute to this successful result, are available to *you* to improve jobs you're now doing or to suggest entirely new uses for Coated Abrasives in your operations.

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either to Troy or our nearest branch.

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Yesterday, today and tomorrow—

A Major Contributor

to grinding wheel advancement

IN HOLDING closely to the original policy of its founders to produce only the finest grinding wheels it is possible to build, Peninsular engineers have carried on a continuous and ever-expanding program of study and experimental research since 1889.

Out of the long hours and inventive skill devoted to this pioneering effort have come many new and basic advancements in the fabrication of abrasive wheels—in the machinery for their manufacture—and in the methods for their application to modern industrial problems.

The fine reputation that Peninsular enjoys today is largely the result of these major contributions to the grinding wheel industry.

In the days to come, you may expect from Peninsular continued improvements to help industry speed up the war effort and be ready for conversion to peacetime production when victory is won.

A STANDING INVITATION

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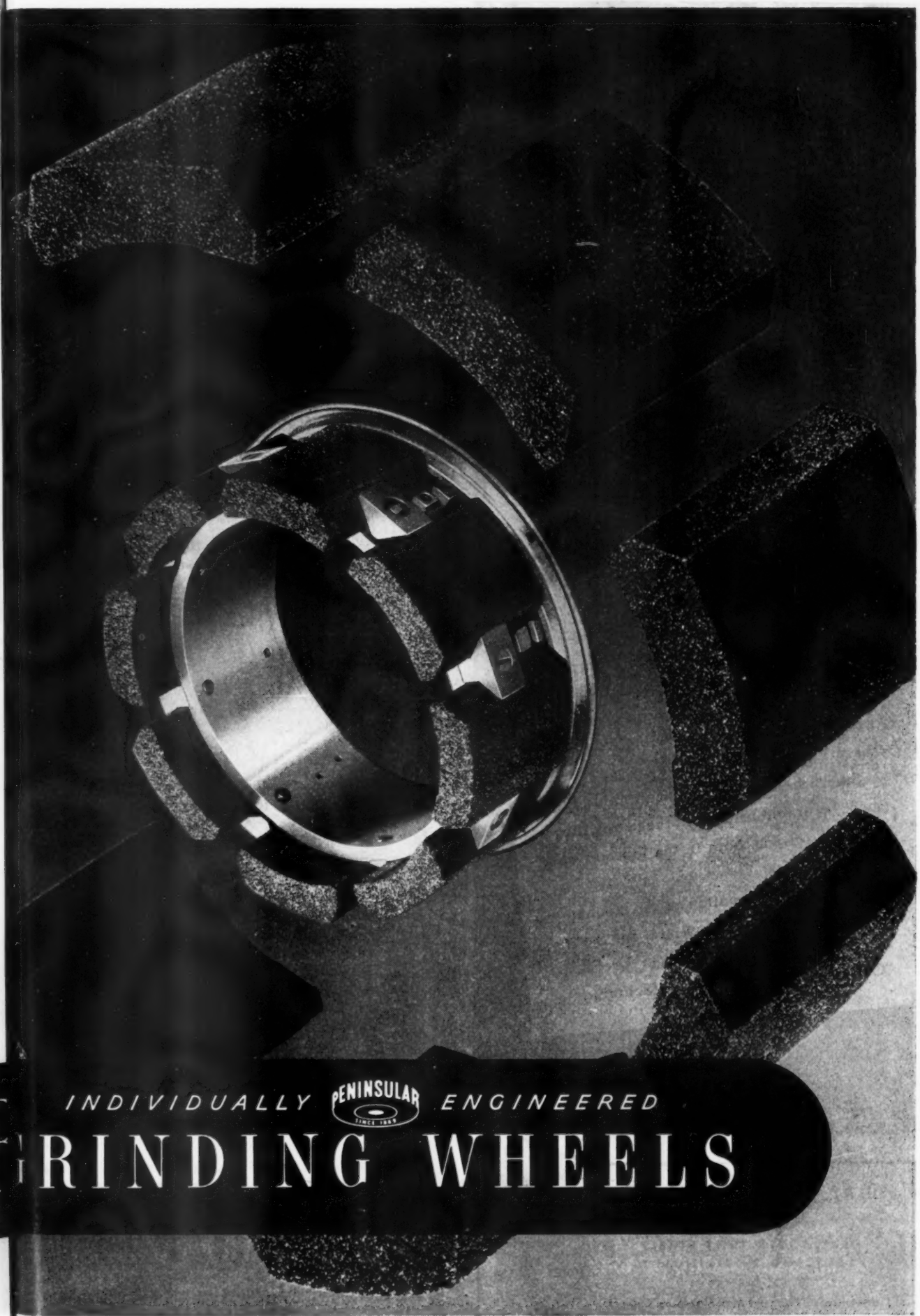
SPECIALISTS IN RESINOID BONDED WHEELS

PENINSULAR

SINCE 1889

Illustration shows segments and chuck for surface grinding.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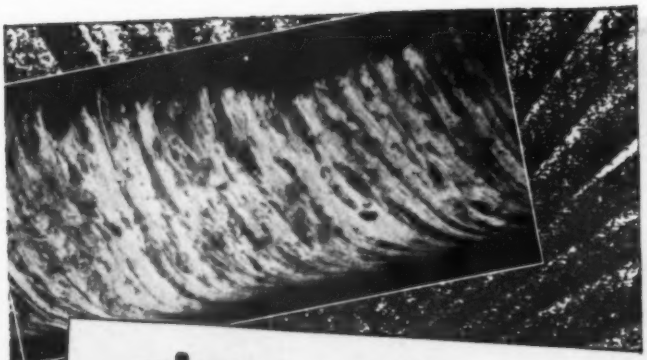


picture of a "Frozen Explosion"*

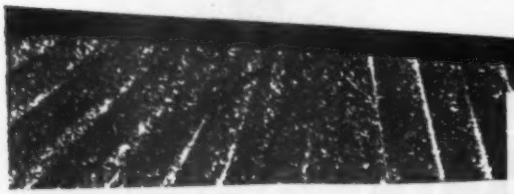
*Photomicrograph of metal chip

● When metal is machined, pressures between the moving body of the piece being machined and the tool edge develop elastic and/or plastic forces *within the workpiece*. The release of these forces literally *explodes* successive portions of metal, sending them streaming forth in the form which we call a chip.

Metal-cutting is a matter of metal behavior and flow, in which complex process the cutting fluid regulates temperature, lubricates rubbing surfaces, prevents welding, and possibly dampens vibrations.

Stuart men are skilled in attaining the most favorable balance of these qualities in cutting fluids, both in the lab and on your machines.

For further information on the mechanics of metal-cutting, write for your free copy of Stuart's 60-page booklet, "Cutting Fluids for Better Machining."



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LIMITED
2729 SOUTH TROY STREET
CHICAGO 23, ILLINOIS
ESTABLISHED 1865
Warehouses in Principal Metal-Working Centers

Angier
OF FRAMINGHAM

INDUWRAP

Airplane engine and parts manufacturers were up against it for a greaseproof wrapper to prevent corrosion. Angier of Framingham produced it in INDUWRAP, which has more than met any specification ever drawn for a Grade A, Type I wrapper.

If you have a *corrosion* problem, ask for samples of INDUWRAP and for descriptive folder, "The Touch of Death to Steel." You'll be especially interested in INDUWRAP'S exclusive infused *Inhibitor* metal-contacting surface. This kills corrosion before it starts by depositing a transfer film on the exposed metal spots, often caused by breaks in the protective oil film.

Other important features are that INDUWRAP is creped to S-T-R-E-T-C-H. It lets packaged metal breathe. It is soft and pliable, molding easily to hug odd-shaped articles snugly — without rupturing. Investigate INDUWRAP.

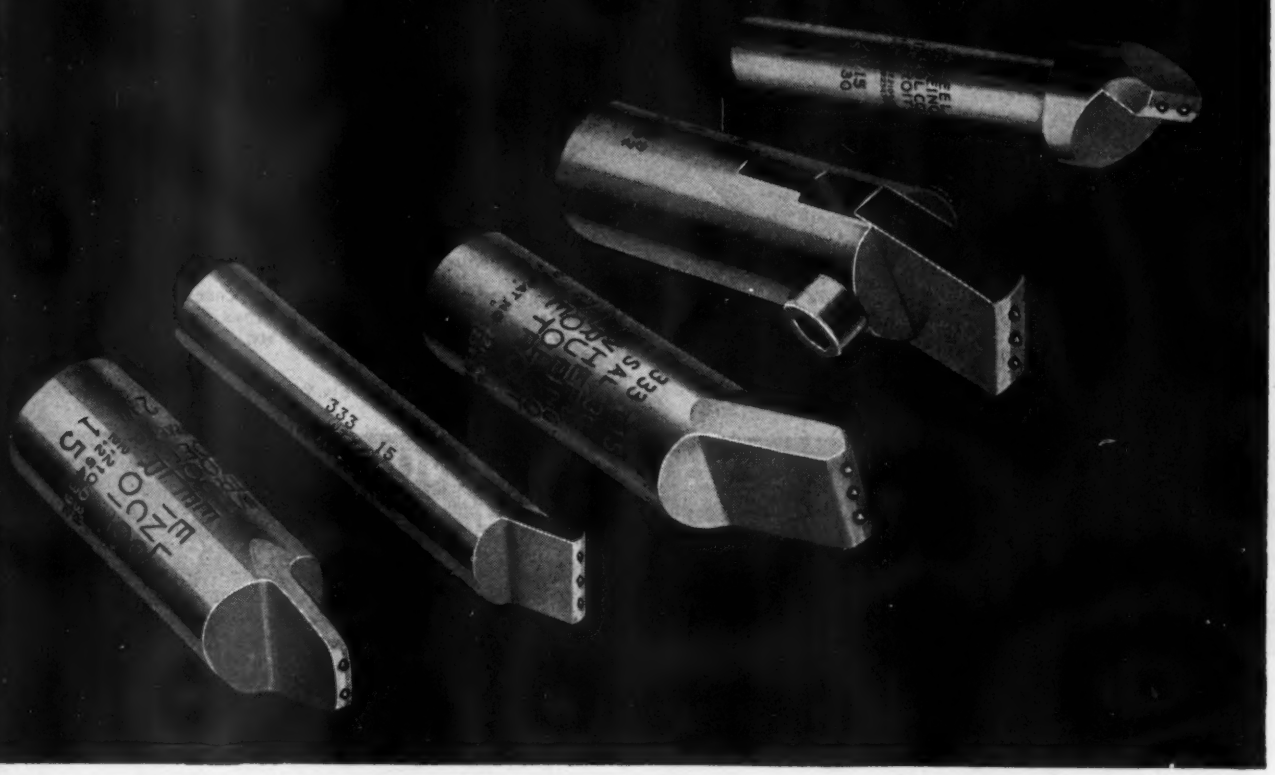
In writing for samples and literature, please mention IRON AGE.

Angier

ANGIER CORPORATION
CORROSION PREVENTIVE AND WATERPROOF PAPERS
FRAMINGHAM, MASSACHUSETTS

YOU'LL SAVE FOUR WAYS WITH THESE

'TRU-LINE' *Diamond Tools*



TRU-LINE multiple diamond tools require no turning. Machine down-time is reduced, production increased.

Diamonds are set in overlapping rows, providing a continuous and efficient cutting surface for the life of the tool—without changing, re-setting or adjusting.

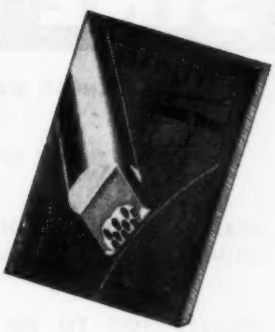
Matrix forms a chemical bond with the diamonds, holding them securely until entirely used. Thin blade dissipates heat, safeguards the diamonds.

The effective use of smaller, carefully selected, high quality diamonds permits much lower diamond tool costs, yet assures efficient cutting.

TRU-LINE multiple diamond tools have consistently demonstrated their ability to deliver these four kinds of savings under all conditions of use on vital war material where speed, accuracy and finish are important factors. On many jobs they have completely replaced ordinary diamond tools.

There is a TRU-LINE tool for every type of straight, profile or step-dressing operation.

Send For This Book



It gives complete information on TRU-LINE tools, shows how they save time and money. Your copy gladly sent on request.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
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CARD TAPS

ARE YOU INTERESTED IN BETTER TAPPING?

If better production tapping is your objective, it will be to your advantage to come to Card. We can help you because we sell better tapping performance.

The high quality of work done—the quantity produced—the economy of using Card Taps—will be apparent on any tapping job. Just put Card Taps to work and let them prove their superiority.

A regular catalog tap in most cases will meet your needs without using special taps. You'll find your requirements covered in the Card Catalog No. 34. Write for a copy.

Card taps are sold by leading dealers everywhere

S. W. CARD MANUFACTURING CO.
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SINE BAR MILLING TABLE

FOR ALL ANGLE MACHINING

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TILTS IN EITHER DIRECTION

•

ADAPTABLE FOR USE ON MILLING MACHINES, PLANERS, BORING MILLS, ETC.

•

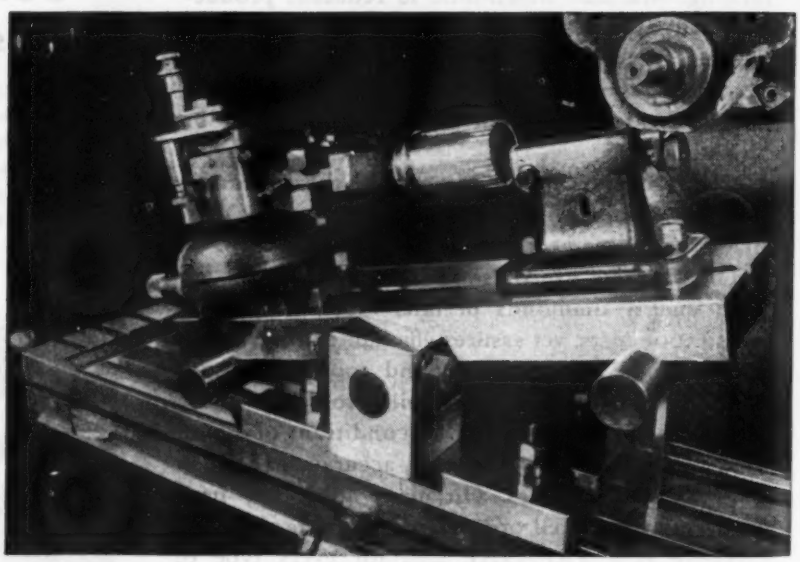
ENABLES YOU TO DO WORK NOW REQUIRING FAR MORE EXPENSIVE MACHINES

•

CUTS SET-UP TIME

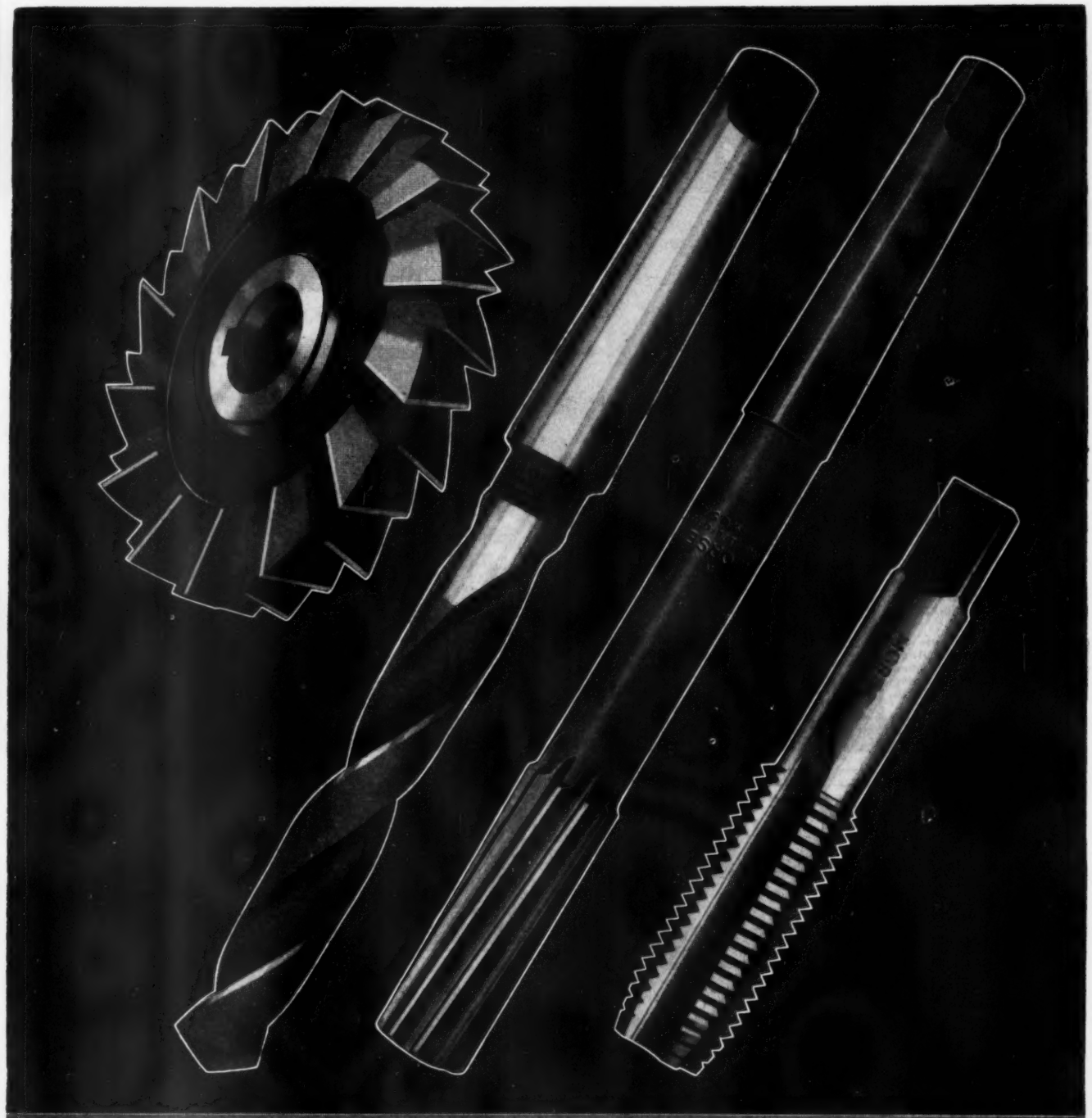
•

TWENTY INCH SINE BAR CONSTRUCTION INSURES ACCURATE SETTING OF ANY ANGLE UP TO FORTY-FIVE DEGREES IN EITHER DIRECTION



View showing index head and center mounted on this fixture for milling slots in cylinder at a multiplicity of angles. This set-up eliminates the necessity of making special riser blocks to mount index centers

ORDNANCE GAUGE CO. 4080 Frankford Ave., Philadelphia 24, Pa.



"BIRDS OF A FEATHER . . ." Never any variation in Morse Tools. They're all made to the same exacting precision standards. That's why it pays to standardize on Morse Tools if you want uniformly efficient and economical results from your expensive machine tools.

MORSE THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

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STOP making expensive jigs for every special lathe job

IMMEDIATE DELIVERIES!

Now Best Tools brings you the New Time and Labor Saving

No. 51 Lathe Angle Plate

NO. 51 LATHE ANGLE PLATE

enables your shop to turn out work samples or short or long production runs without building jigs or fixtures

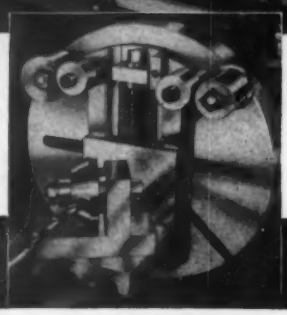
For Off-Centre and Compound Angle Lathe Operations

Write for Illustrated Booklet G

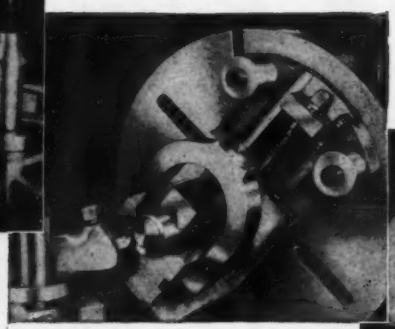
MADE IN TWO SIZES

No. 51 for 12, 14, and 16 in. swing lathes
No. 52 for 9 and 10 in. swing lathes

No. 51 — Complete with straight adjustable clamp. Equipped with centering gauge with provisions for counter-balances. Shown boring offset radius.



No. 51-A—Multi-use accessory for Lathe Angle Plate, especially for offset angle boring and turning. Can be indexed to 12 divisions.

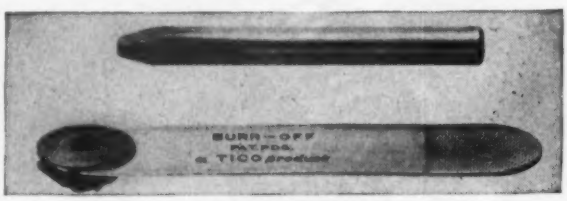


No. 51-B—Lathe angle plate is shown with accessory B turning an eccentric.

No. 51-C—Shown with work holder C, the Lathe Angle Plate is shown finish-boring a die plate.

BEST TOOLS CORPORATION
ROCKVILLE CENTER, LONG ISLAND, N. Y.

"BURROFF"



PAT. NO. 2351878

For fast clean removal of burrs and chamfering holes (inside & outside) of multi-walled parts—where regular solid countersinks will not reach.

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JOHN H. GRAHAM & CO.—105 DUANE ST., N. Y. C.
MADE BY
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LUERS Potented Cutting Off Tool Holders
Potented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
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"WORLD'S FINEST CARBIDE"

Tantalum-Tungsten
CARBIDE Tools, Blanks and Dies
TANTUNG Cast Alloy Cutting Tools.

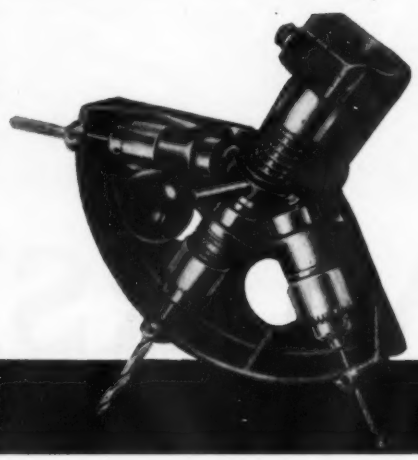
4504

VASCOLOY-RAMET CORPORATION
NORTH CHICAGO • ILLINOIS

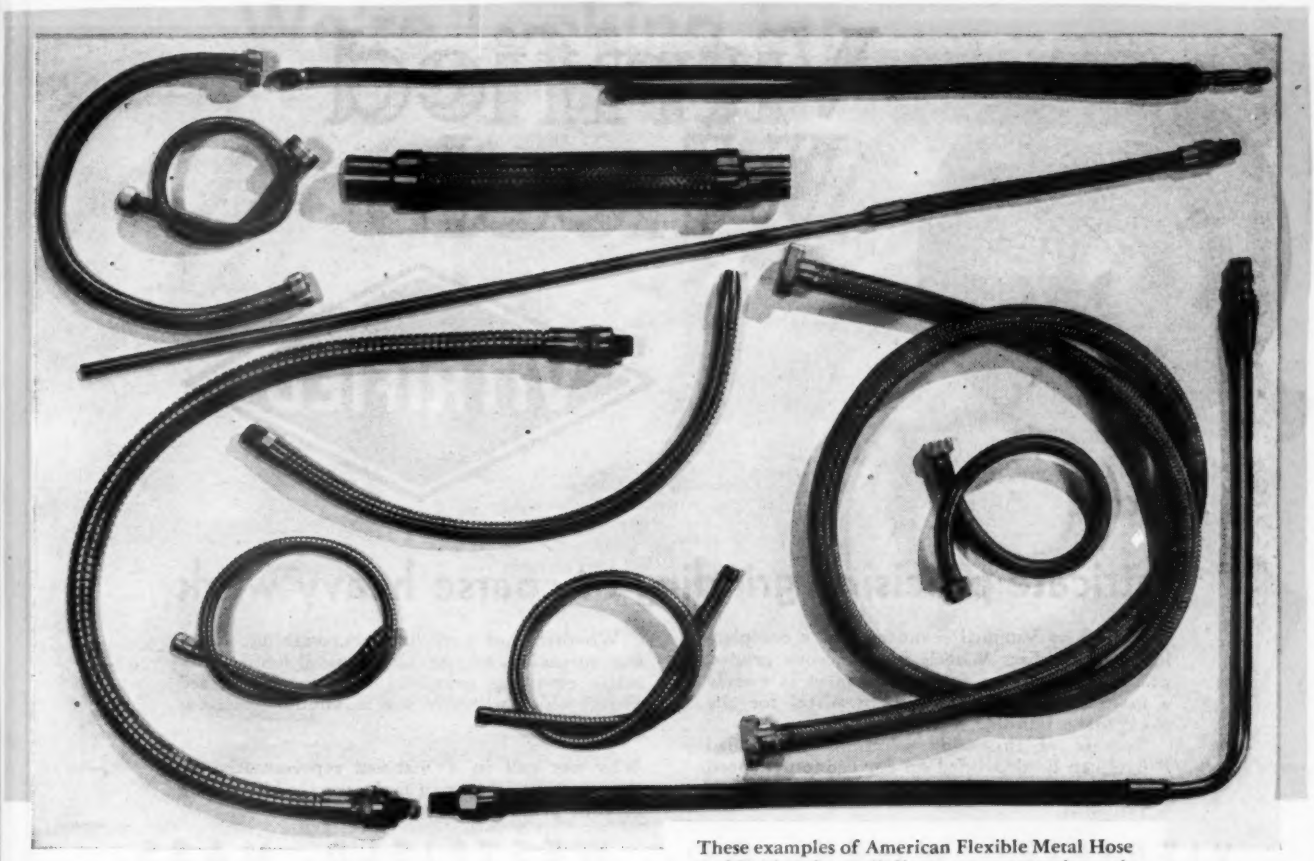
UNIVERSAL
DRILL PRESS TURRET HEAD

Clamps on quill of any standard Drill Press giving operator immediate choice of three different sized drills or tools. This permits continuous operation through elimination of moving work to different presses, thus effecting a saving in time and tooling.

It is simple to attach, you merely remove the chuck and depth gauge, slip the bracket over quill, tighten, and your three-position drill press is ready. The turret is equipped with three Jacobs chucks, ¼" capacity and is designed for maximum strength and rugged use. Shifting from one position to another is accomplished by a light movement of indexing lever. Positive indexing positions are provided for long life. All parts are interchangeable and tool maintenance is extremely simple. WRITE TODAY FOR FULL INFORMATION.



The Universal Engineering Co.
2230 NATIONAL AVENUE • SAN DIEGO 2, CALIFORNIA



These examples of American Flexible Metal Hose and Tubing, in small diameters, suggest the variety of assemblies available in factory-engineered and factory-assembled units.

Flexible...BUT RUGGED TOO!

WHEREVER a flexible conveyor is required, for gases, liquids or solids, under a wide range of temperatures and pressures, there's a type and size of American Flexible Metal Hose or Tubing for the purpose.

American Seamless Flexible Metal Tubing is as leakproof as the seamless bronze tube from which it is made, and flexible as garden hose. Its wire braided cover adds the strength needed for high pressure services. Standard sizes from ⅛″ to 4″ I.D.

American Metal Hose, manufactured from strip in four spirally wound types, is available in bronze, brass, aluminum, steel or any other workable metal. It is extensively used for carrying steam, water, oils, tar, asphalt, air, dust—and dozens of other agents under high and low pressures and for vacuum work. Sizes from ½″ to 12″ I.D.

Both types of "American" products can be fabricated completely with fittings and connections according to your specifications. Publication SS-50, giving complete information, will be sent on request. 45059

ANACONDA *American Metal Hose*

AMERICAN METAL HOSE BRANCH OF THE AMERICAN BRASS COMPANY • General Offices: Waterbury 88, Conn.
Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

BUY WAR BONDS . . . Buy all you can . . . Keep all you buy!

Vitrified Wheels

VITRIFIED

... for

intricate precision grinding or coarse heavy work

Inasmuch as Vitrified manufactures a complete line of Grinding Wheels in numerous grades, grain combinations and bondings, it is merely a matter of selecting the right wheel for the work to be handled.

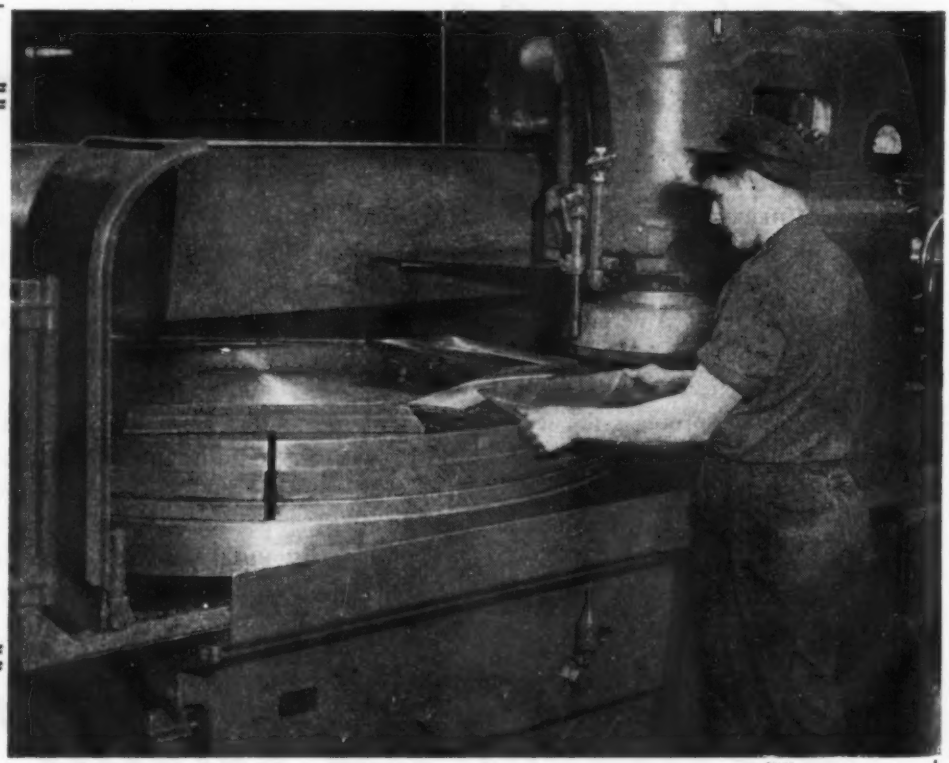
Because of this wide selection, a Vitrified Wheel can be depended on for economy, speed and long life in the specific service for which it is intended.

Whether your work involves roughing, finishing, surfacing, edging, or cleaning, hand, automatic or swing grinding, there is a Vitrified Wheel which will give you maximum service at minimum cost.

Why not call in a Vitrified representative to show you how you can make worthwhile saving in your grinding operations?

VITRIFIED WHEEL CO., WESTFIELD, MASS.

Illustrated on a large grinder is a Walker 72" Electro Magnetic Chuck. As evidenced by their universal use, Walker still pioneers the field.



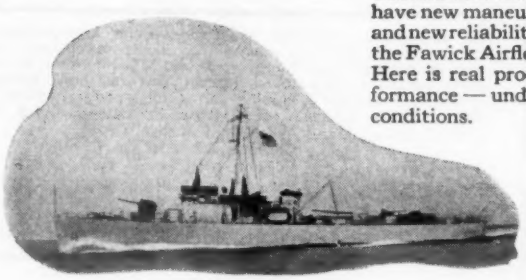
Submit your production problems to

O. S. WALKER CO., Inc.

100 ROCKDALE STREET **WORCESTER, MASS.**

We're Looking for

Clutch Trouble



Thousands of naval vessels have new maneuverability and new reliability through the Fawick Airflex Clutch. Here is real proof of performance — under battle conditions.

Now you can equip your heavy duty machines with a clutch that is proof against trouble.

The Fawick Airflex Clutch controls torque by air. Actually, it gives you air-cushioned power. It absorbs shock and vibration, with a clutch grip as firm, or as light, as the job requires.

This revolutionary new clutch needs no arms, levers or springs. It requires no adjustments, no lubrication. It corrects automatically for misalignment. Maintenance costs are unusually low.

The Fawick Airflex Clutch has proved itself in heavy duty service—for Diesel drives, marine and industrial, presses, rubber, paper and steel mills, hoists, draglines, cranes and shovels—wherever the going is tough.

Write us for engineering recommendations based on broad clutch experience.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. • Cleveland 11, Ohio

In Canada, **Renold-Coventry Ltd., Montreal, Toronto, Vancouver**

In Britain, **Crofts Engineers, Ltd., Bradford, England**

12 Important Advantages

1. **Simple in design and operation**
2. **Flexible control by air**
3. **No adjustments or oiling—low maintenance**
4. **Dampens vibration—absorbs shocks**
5. **Corrects misalignment automatically**
6. **Smooth starting—no jerks**
7. **Runs cooler—uniform pressure**
8. **Controls torque by air pressure**
9. **Greater capacity—more compact**
10. **Remote control by air valve**
11. **Replaces flexible couplings**
12. **Acts as clutch, slip-clutch, brake and coupling**

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR

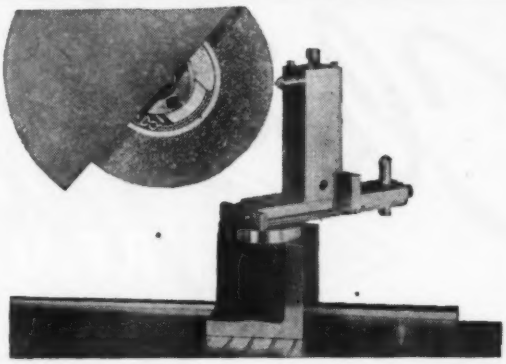
CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

The "FORM-MASTER"
ANGLE & RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. diamonds and instrument case included. $150.00.

It readily produces: Any desired angle
Convex radii to 4" on 7" wheel
Concave radii to 7" on 7" wheel

Specifications: Base 3" x 3", height 8½"
Wheel capacity 10"
Angular travel 3"

For information or a demonstration CALL YOUR SUPPLIER

Manufactured by

J. & S. TOOL CO.

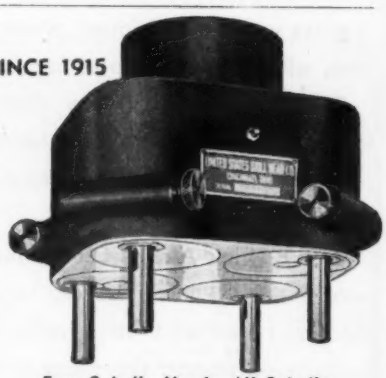
477 Main Street East Orange 1, N. J.

"PRECISION DRESSING TOOLS"

STANDARD US HEADS SINCE 1915

All Types of Fixed Center

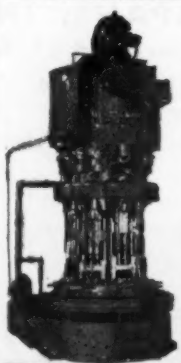
DRILLING TAPPING & BORING HEADS



Four Spindle Head. All Spindles Adjustable for equally spaced holes.

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS

UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO



Vertical ROTO-MATICS

Multiple spindle drill heads and automatic clamping provide added production.

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

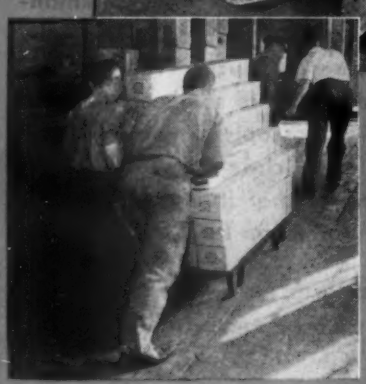
Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

6411 W. Burnham St. Milwaukee 14, Wisconsin

HAND TRUCKING TO "Electric Propelled" SAVES 46%

Above
One man and "TRANSPORTER" moving 1800-pound skid load into car. This handling operation is a big factor in reducing car loading time.



Above
One man and a "TRANSPORTER" easily move an 1800-pound load on a ramp.

Left
This same job done by the old way with hand truck requires four men.

A profitable solution to plant trucking problems was made by the Line Material Company, South Milwaukee, Wisc., through the use of Battery Powered "TRANSPORTER" PLATFORM LIFT TRUCKS.

PROBLEM . . .

Departmental and general plant skid load trucking of various materials used in the construction and operation of electric power lines. Trucking done in a series of three story buildings with bridges, overpasses, and ramps 6 to 30 feet, average grade 12%, requiring as many as four men per skid trucking.

SOLUTION . . .

"TRANSPORTER" operations effected monthly savings of $1020.00 based on 30,000 productive standard hours or 46% savings over back breaking job of hand trucking over ramps.

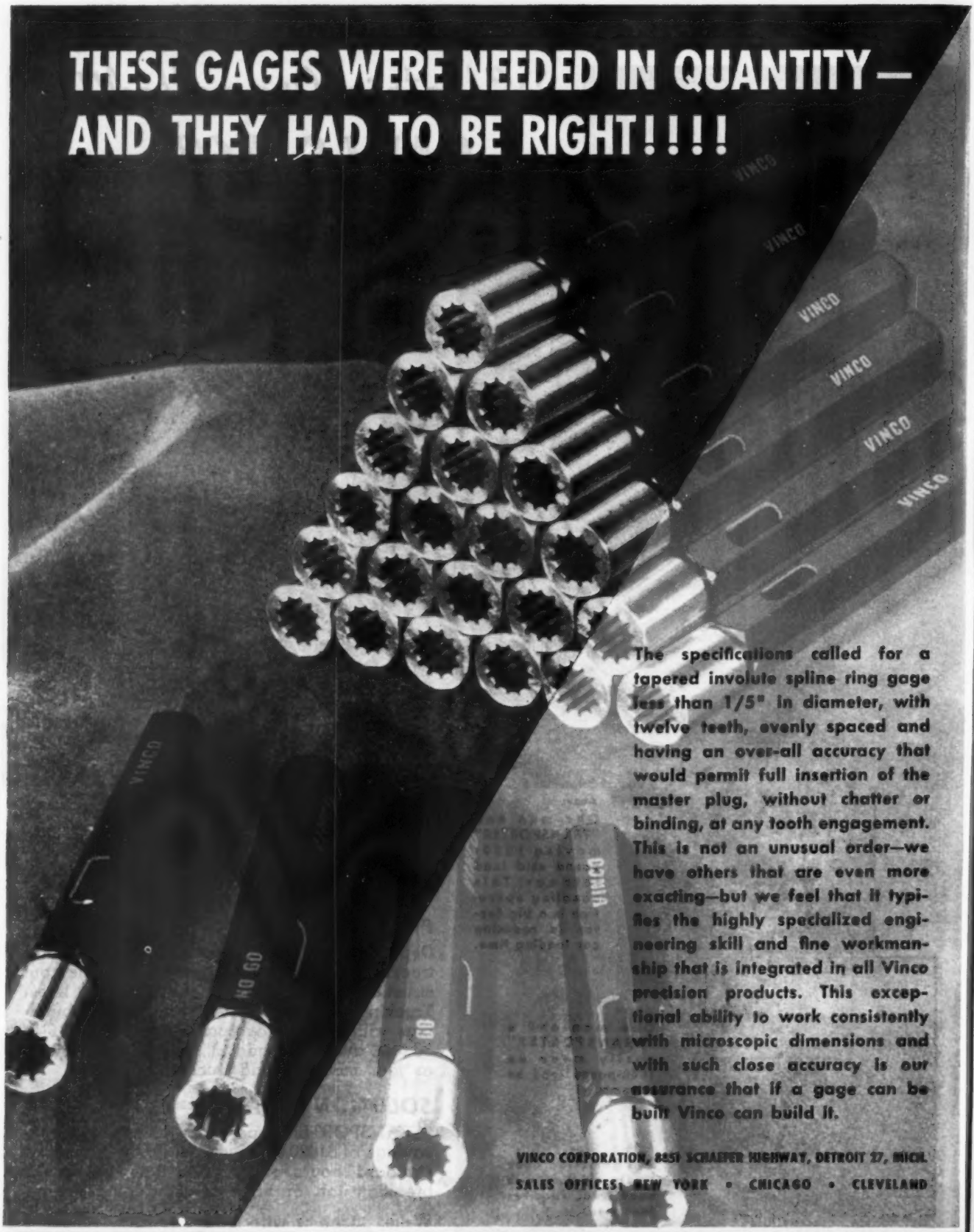
Write, phone or wire today for complete facts.

MANUFACTURERS FOR OVER 38 YEARS *Electric Propelled* INDUSTRIAL TRUCKS

ELECTRIC INDUSTRIAL TRUCKS
MEMBER OF ELECTRIC INDUSTRIAL TRUCK ASSN.
208 South La Salle St., Chicago, Ill.

AUTOMATIC TRANSPORTATION CO.
59 WEST 87th STREET CHICAGO 20, ILL.
Division of the Yale & Towne Manufacturing Company

THESE GAGES WERE NEEDED IN QUANTITY— AND THEY HAD TO BE RIGHT!!!!



The specifications called for a tapered involute spline ring gage less than 1/5" in diameter, with twelve teeth, evenly spaced and having an over-all accuracy that would permit full insertion of the master plug, without chatter or binding, at any tooth engagement. This is not an unusual order—we have others that are even more exacting—but we feel that it typifies the highly specialized engineering skill and fine workmanship that is integrated in all Vinco precision products. This exceptional ability to work consistently with microscopic dimensions and with such close accuracy is our assurance that if a gage can be built Vinco can build it.

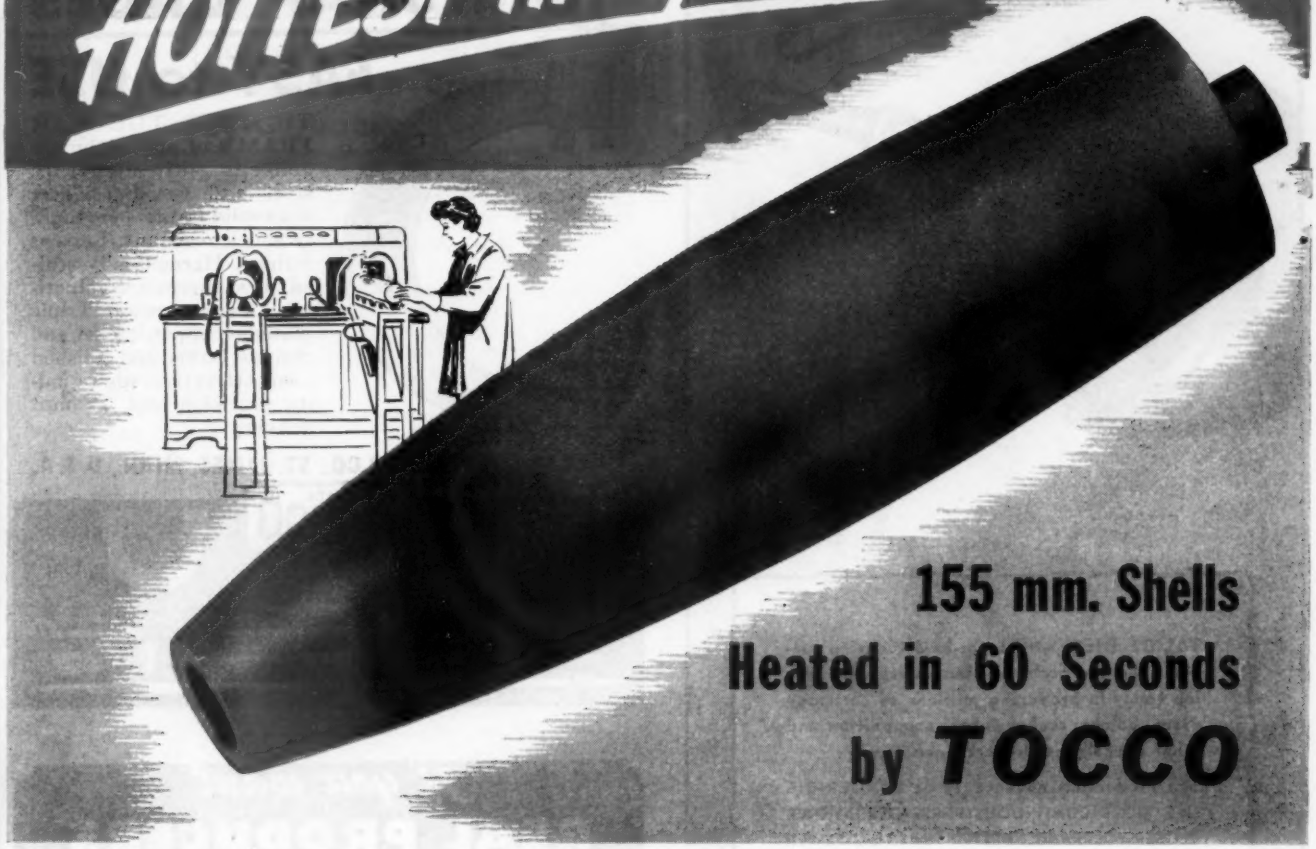
VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICH.
SALES OFFICES: NEW YORK • CHICAGO • CLEVELAND

MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

HOTTEST thing in Ordnance



155 mm. Shells Heated in 60 Seconds by TOCCO

HEAVY AMMUNITION . . . highest priority product in the United States today . . . gets top heating speed and top quality in scores of plants with TOCCO Induction Heating.

One large producer reports these advantages of TOCCO heating for nosing 155 mm. shells, compared to conventional heating methods:

HIGH SPEED. A 10″ length of the shell is TOCCO-heated to 1800° F. in 60 seconds. Arranged in pairs, the TOCCO machines supply each nosing press 120 shells per hour.

HIGH QUALITY. Uniform, split-second timing of TOCCO heating, applied to an exact area, assures uniform nosing results for every shell.

DEPENDABLE. TOCCO machine is a compact, self-contained unit including motor-generator and all controls. Simple to install and reliable in operation.

GOOD WORKING CONDITIONS. No radiant heat. No smoke. Speedy, *localized* TOCCO heating permits easy handling of heated shells with gloved hands. Simple for girls to operate.

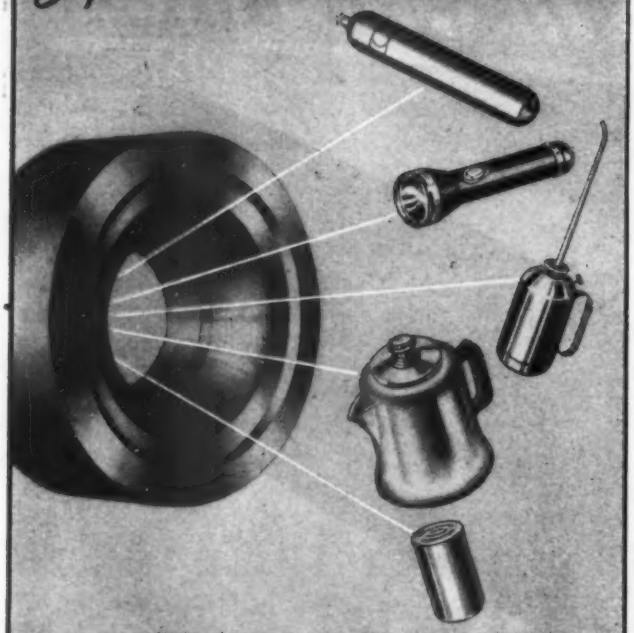
Call our Engineers for assistance in the application of TOCCO to *your* war production and postwar planning. A free copy of "Results with TOCCO" is yours for the asking.

THE OHIO CRANKSHAFT COMPANY · Cleveland 1, Ohio

TOCCO

INDUCTION
HARDENING . . BRAZING
ANNEALING . . HEATING

DEEP DRAWN THROUGH··· *Super-hard* TALIDE DIES



TALIDE DIES, with super-hard tungsten carbide nibs, are performing an outstanding War job today in producing millions of cartridge cases, bombs, rocket tubes, ammunition and other critically needed ordnance items.

The production advantages of LONGER DIE LIFE, MORE CONTINUOUS PRESS OPERATIONS, CLOSER TOLERANCE, BETTER FINISH and FEWER REJECTS are increasing the output of press lines all over the nation.

Tomorrow . . . these advantages plus the extra hardness, density and toughness of Talide Dies will make it possible to mass produce at lower cost deep-drawn automotive parts, kitchen utensils, flashlight cases, cosmetic containers, food and beverage cans, high pressure gas tanks and a multitude of other peace-time products.

Talide Sheet-Metal Dies, made by our exclusive Hot Press Method, are available in hole sizes up to 24". Our experienced organization is at your disposal.

TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION YOUNGSTOWN, OHIO

METAL CARBIDES CORPORATION
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TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

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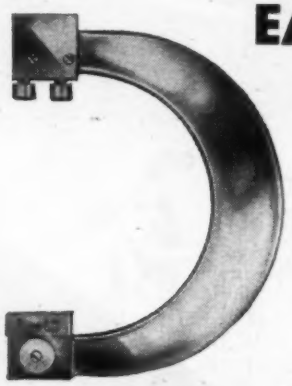

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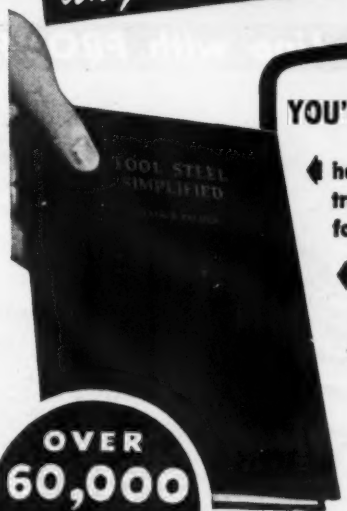

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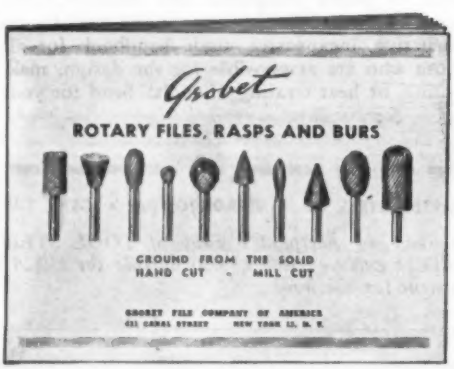

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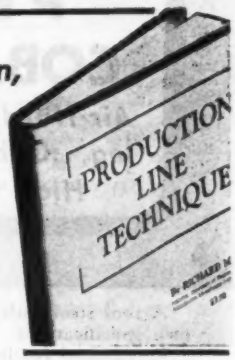

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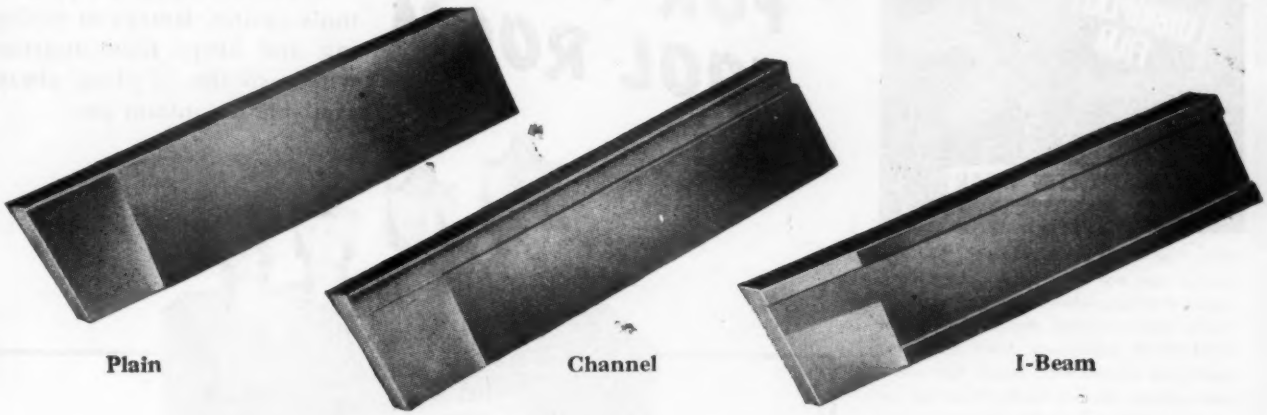

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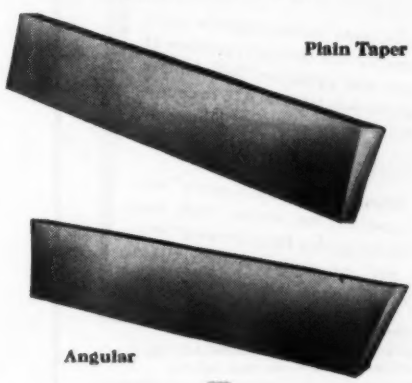

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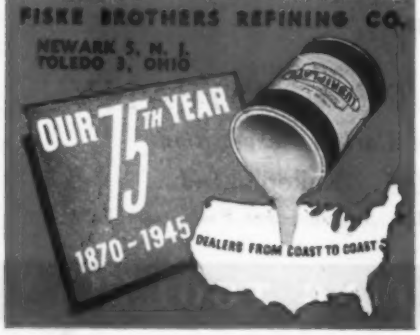

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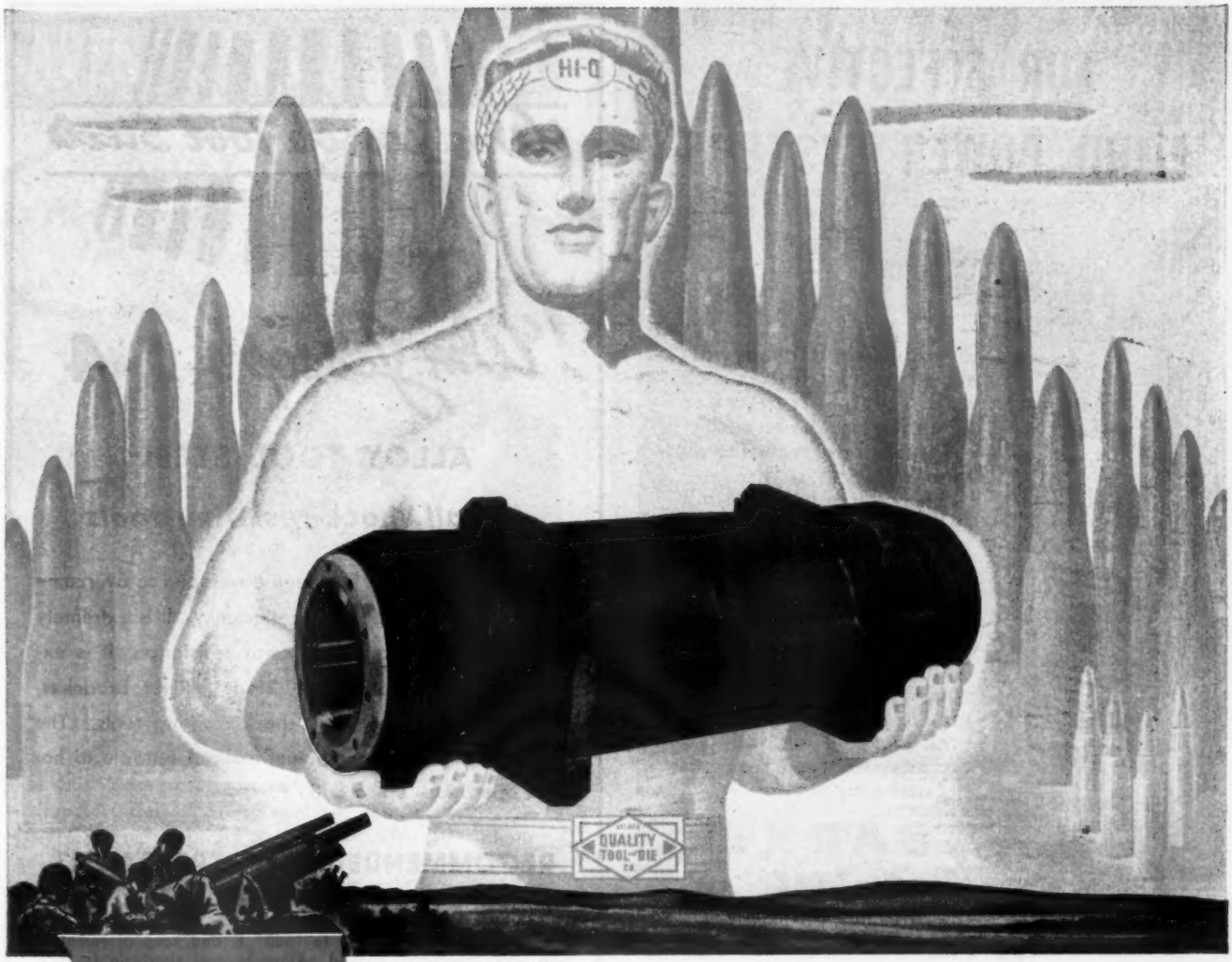

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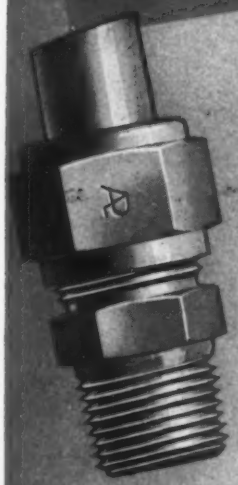

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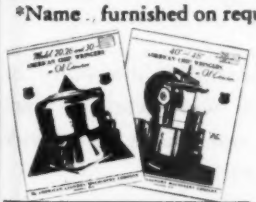

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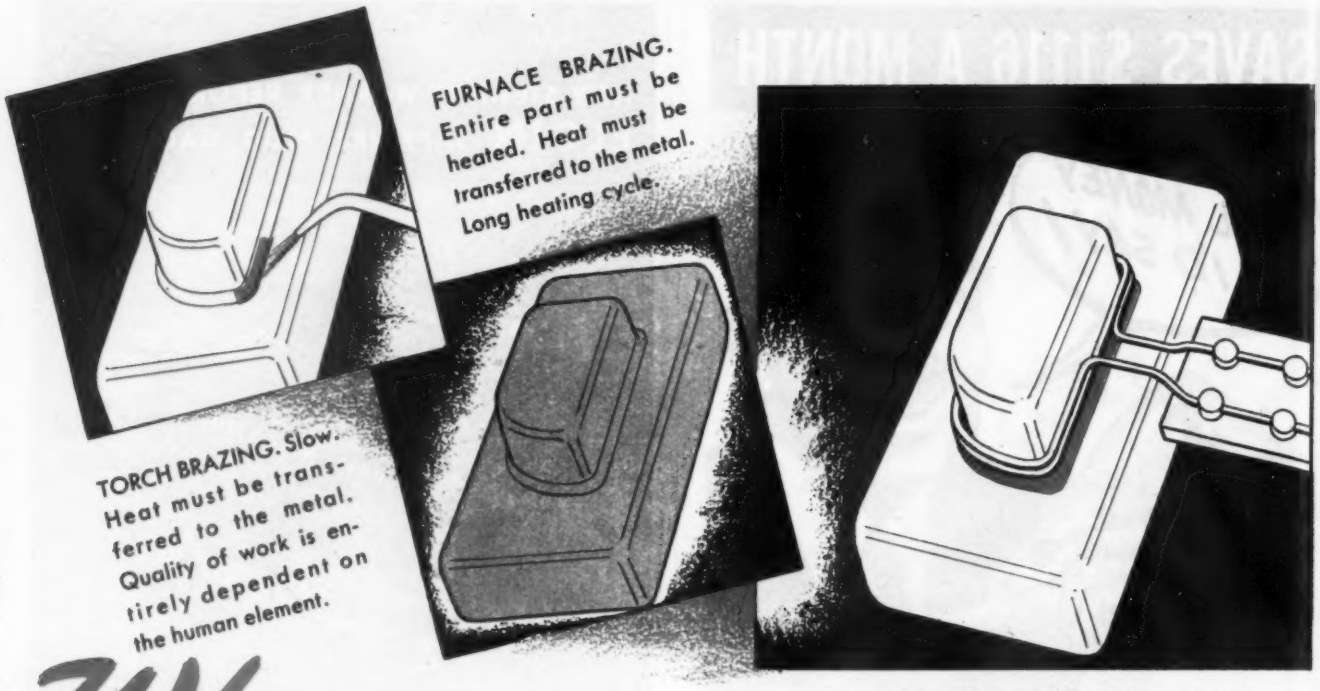
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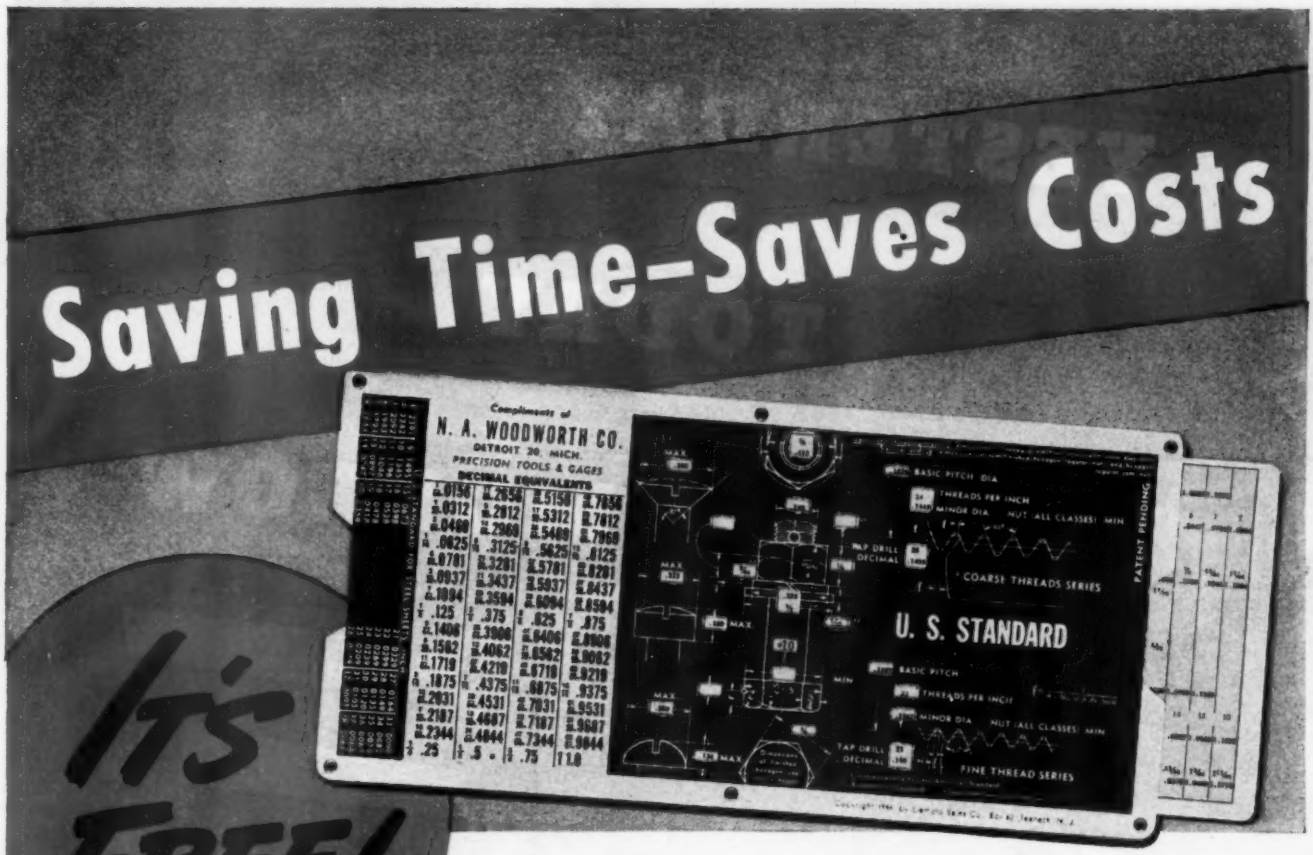

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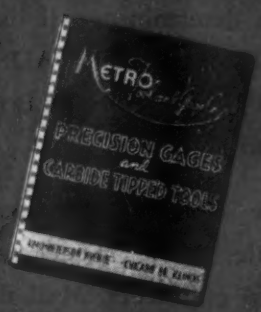

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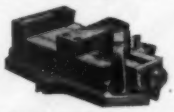

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For fast, heavy work. Adjustable cam locking lever. Movable jaws, hardened and ground. Sizes 3" to 8" Jaws.

FLANGED MILLING MACHINE VISE

Clamps to table of milling machine, grinder, etc. For heavy work. Has hardened and ground jaws 6" wide, 2" deep.

DRILL PRESS VISES

For every purpose. Accurately machined, best semi-steel castings. Long bearing adjusting screw. Jaws hardened steel—plain or grooved. Sizes 1½" to 4".

No. 250 MILLING ATTACHMENT VISE

MAKES MILLING OPERATIONS POSSIBLE ON LATHE

A necessary fixture for small shops and emergency work in large shops. Fits 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon or other lathes of similar sizes. Has graduated vertical angle adjustments. Easily mounted on cross slide and held by one T-Slot bolt. PALMGREN VISE has 2½" Jaws opening full 2 1/16". Depth Jaw 1-7/16", one plain and one grooved jaw for holding round pieces. Height 10½", Price $24.75.

WRITE FOR CIRCULAR 348—Contains full description and prices of our complete line of vises.

CHICAGO TOOL and ENGINEERING CO.
8354 South Chicago Avenue Chicago 17, Ill.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

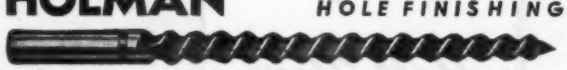
NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

DIES GEO MET RIC *TAPS*

Right in the Lead

THE GEOMETRIC TOOL CO.
NEW HAVEN 15, CONN.

HOLMAN *BETTER, FASTER HOLE FINISHING*



HELICAL TAPER PIN REAMERS

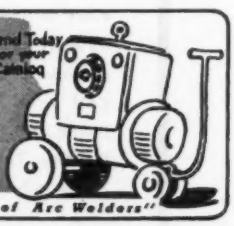
Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

HOBART *"Simplified"* **arc welders**

with the original and exclusive REMOTE CONTROL

Send Today for your Catalog



HOBART BROTHERS CO., Box A.M. 2-1 TROY, OHIO *"One of the World's Largest Builders of Arc Welders"*

RANDALL & STICKNEY

Universal Gauge

for rigid inspection of a wide range of parts . . .

An almost unlimited use is offered by this instrument for inspecting duplicate parts in quantity or any small parts with flat surfaces or recesses.

Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch; height 9⅝"; weight 5 lbs. 1¼ oz.; depth from frame to spindle 1⅝".

Can be supplied with sliding head and table; also on a stand with throat 3" deep.

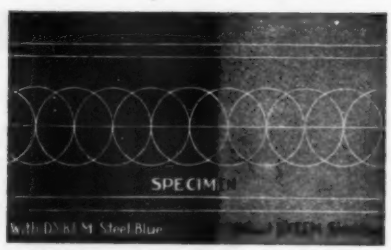
Full details on request

RANDALL & STICKNEY
Makers *Waltham 54, Mass.*

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
In Canada: 444 Pacific Ave., Toronto, Ont.

LIFTING...MOVING...STACKING are faster with the HYSTER "20"

Hyster "20" Lift Truck (2000 lbs. capacity) handling crated airplane parts.

The Hyster "20" lift truck saves time and money on materials handling jobs. The unit is powered with a 25 h.p. gas motor. Equipped with pneumatic tires. Picks up and transports materials quickly. Travels over rough ground or crowded warehouse floors with ease. Turns in its own length, is easy to handle and—being only 36 inches wide—gets in and out of tight spots or narrow aisles easily and efficiently.

A three-wheel arrangement—with the rear wheel mounted on a trunnion—allows great maneuverability. Rounded rear body corners permit turning in close quarters and minimizes damage risks. Sturdy thirty-inch lift arms can hoist a 2,000 pound load to nine feet.

The Hyster "20" saves time, manpower and money. Hyster makes a complete line of industrial lift trucks. Write for illustrated literature.

HYSTER COMPANY
Portland 8, Oregon, U.S.A.

●

Pioneers in Materials Handling Equipment

HYSTER
FOR ANY LIFT OR PULL

HYSTER

THIS ONE WEIGHS 450 LBS.

This big POPE Spindle is a live center tailstock for a production engine lathe. The Spindle is 53" long, 6½" in diameter. Its center is easily removable without disturbing the bearings. The shaft in which the center is mounted is carried on preloaded roller bearings capable of supporting work pieces weighing 10 tons.

The thrust bearings are preloaded to 7000 lbs. initial end pressure and are yieldingly mounted for axial movement. This provides automatic compensation for the expansion of the work piece from the heat of the cutting tool.

THIS ONE WEIGHS 1½ LBS.

This "ladyfinger" size spindle is an example of the small spindles built by POPE. It is 6¾" long, 1¼" in diameter. It operates at 40,000 RPM in a small profile grinder.

These large and small spindles are illustrated to show that POPE Precision Spindles may be had over a wide range of sizes as well as styles. We are prepared to build them as large or as small as you may need.

Be They Large Or Be They Small

POPE Will Build Them For You

POPE builds into a spindle what it takes to do the job right and to keep on doing it right.

POPE engineering skill and POPE precision craftsmanship are devoted exclusively to the development and production of the best possible spindle for the job. This means plenty of steel, plenty of bearings of the right kind, size and quality, and above all, skilled engineering and fine workmanship.

POPE Spindles feature Sealed Lubrication, specially selected precision bearings, rugged ability to stand up under hard work and at the same time to produce a better final finish.

★ ★ ★

Send us a sketch or description of the spindle you require and we will furnish you cost and delivery estimates.

POPE

REG. U. S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

Output Climbed 60%

WITH A *Barker* WRENCHLESS CHUCK

Production shot up from 75 to 120 bronze plugs per hour when the Atlantic Brass Works installed a Barker Two-Jaw Wrenchless Chuck. The operations are center, face, and box mill. The lathe is not stopped to set or remove the work.

Barker Wrenchless Two-Jaw Chuck

Barker Wrenchless Three-Jaw Chuck

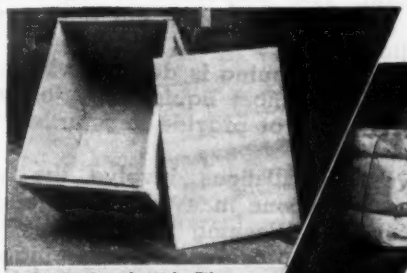
The experience of this user is typical of the reports from hundreds of manufacturers who are operating Barker Wrenchless Chucks—substantial dividends in more parts per hour, and lower cost per part.

You, too, can have these vital advantages. Write today for full information!

THOMAS HOIST CO.
Chuck Division
20 South Hoyne Avenue, Chicago 12, Illinois

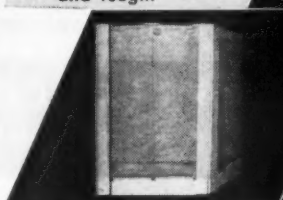
FIBREEN
SISAL-REENFORCED WATERPROOF PAPER

FOR PROTECTION IN TRANSIT!

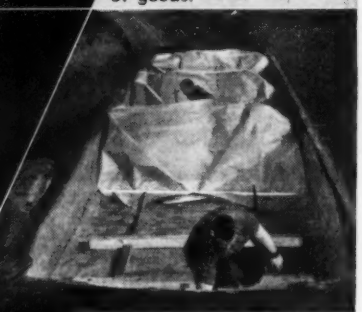


CASES lined with Fibreen are moisture and dirt proof. Fibreen is pliable — and tough.

BALES of all sizes and shapes, made with Fibreen, protect all types of goods.



CRATES built on skids, with engines, pumps or electric motors wrapped in Fibreen, save money for shipper.



OPEN-CAR shipments of heavy machinery need Fibreen to protect goods from weather and dirt.

ROLLS wrapped with Fibreen shut out weather and dirt.

CUT LOSSES IN SHIPMENTS

In postwar competition, *make sure* that *your* products have the best protection to destination. *Make sure* that losses due to inadequate "wrappings" are eliminated. Use Fibreen. As Fibreen is released from war duty, orders can be filled to meet your needs. One thickness of Fibreen often makes a better wrapping than several layers of other materials.

Write, right now, for details.

Get A Sample! Test It by Tearing! See How Tough Fibreen Is!

In Canada: ALEXANDER MURRAY & CO., Ltd.

THE SISALKRAFT CO.
205 W. WACKER DRIVE · CHICAGO 6, ILL.
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

Manufacturers of
SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

A thorough, quick cleaning is definitely assured by flowing sequence. Two or more liquids may follow, making it possible to wash, rinse or provide any further treatment as required.

Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer

Barrett Centrifugal Washer — made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

"BUZZER" HIGH SPEED *Gas* FURNACES

Attain High Temperatures

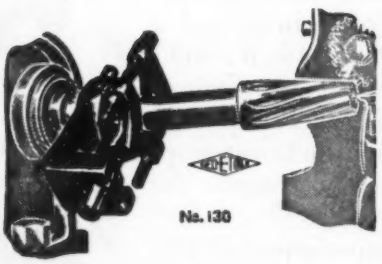
without BLOWER or POWER
. . . just connect to gas supply

FULL MUFFLE FURNACES . . . reach temperatures of 2400° F. without blower or power. Ideal for heat treating high speed and Alloy Steels. Also available in Bench Models.

ATMOSPHERIC POT HARDENING FURNACES . . . tangentially-fired to assure even heat up to 1650° F. are used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

Send for the complete "BUZZER" Catalog

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.



No. 130

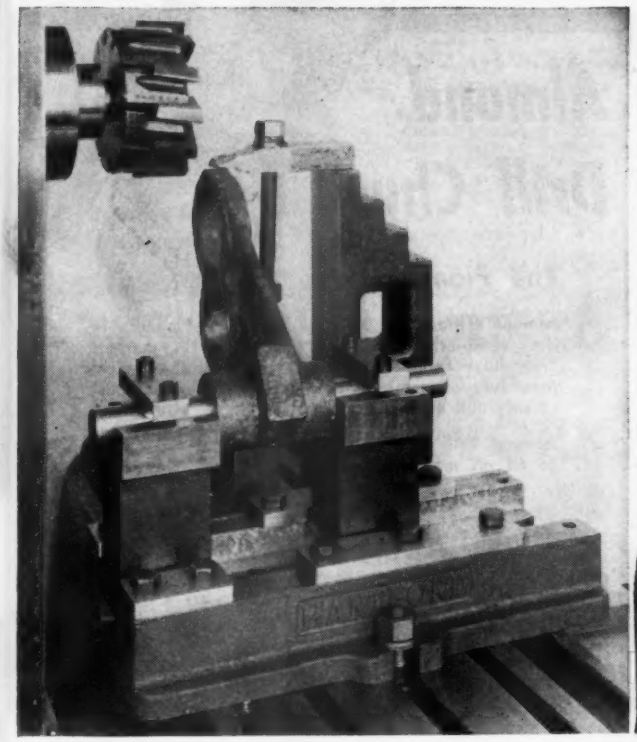
ACCURATE

on straight, spiral or taper work because the ball and socket sliding member eliminates all lost motion. Made in two sizes with #10, #11 and #12 B&S shank; also with #40 spindle.

Write for Catalog A44

The READY TOOL CO.
IRANISTAN & R. R. AVENUES
BRIDGEPORT . . . . . CONN.

THE HARTFORD V-BLOCK FIXTURE
Speeds Set-up for Milling



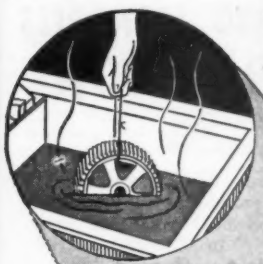
Valuable time is saved and better work assured by this practical, convenient device developed for locating and holding a wide variety of irregularly-shaped work. The end milling operation shown here is but one of many where the Hartford V-Block Fixture contributes speed and accuracy.

The semi-steel base of this fixture is accurately ground and scraped and is provided with ample holding facilities for attaching to table. Clamps for positioning V-Block in base are provided as well as means for holding work. V-Blocks are hardened and ground to assure highest accuracy.

The versatility of use of Hartford V-Block Fixtures makes them an investment which assures high returns in any shop. They are adaptable not only to milling but also to drilling, boring, reaming and inspection.

Write today for detailed information. Literature showing typical applications will be sent promptly on request.

The
HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.
Makers of the famous HARTFORD SUPER-SPACER



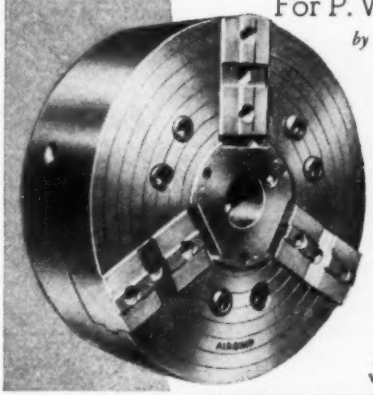
PROX-PEEL *for Packaging**

By simply "dunking" spare parts in Prox-Peel, an enveloping film is applied. Protects against moisture, corrosion, rusting. Removed like peeling a banana. Write for samples, details.

**Available now only for military purposes.*

PYROXYLIN PRODUCTS, INC.
4851 SOUTH ST. LOUIS AVE., CHICAGO 32
NEW YORK
WICHITA
LOS ANGELES

Cut Machining Costs
For P. W.* Competition
by Equipping Your Lathes with
Airgrip CHUCKS



"AIRGRIP" REVOLVING AND STATIONARY AIR CYLINDERS can run for years without attention. Wear automatically taken up by pressure within cylinder. Double ball bearings on Revolving Air Cylinder permit speeds formerly impossible.

*P. W. Post-War

"Airgrip's" Two-Fisted action provides *double gripping power* — Air PLUS a 2-way cam-wedge action. Locks jaws mechanically when gripping *externally* or *internally*. Even if air supply is cut off, double-locking power holds work securely, prevents spoilage and delays.

"AIRGRIP'S" TWO-FISTED GRIPPING-POWER
- *Cuts Machining Costs*
- *Reduces Set-Up Time*
- *Increases Output Capacity up to 100%*
- *Permits Heavier Cuts . . . Coarser Feeds*
- *Eliminates Slow, Difficult Manual Chucking*

OTHER ANKER-HOLTH COST-REDUCERS
Air operated Collets, Arbors, Mandrels, Drill Press Chucks, Finger and Compensating Chucks (2- and 3-jaw), Valves, Lubricating Assemblies, Revolving and Stationary Air Cylinders, Foot Valves, etc. Also Hydraulic Pressure Units and Fittings.

Write, mentioning products on which you desire Bulletins.

ANKER-HOLTH MFG. CO.
2725 Connors St. Port Huron, Michigan

Your Clamping Problems

CAN BE SOLVED

by

KNU-VISE

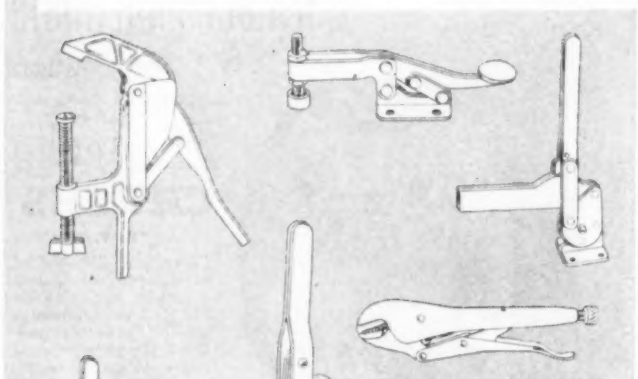
. . . SPECIALISTS IN THE FIELD OF CLAMPING DEVICES

• TOGGLE CLAMPS • "C" CLAMPS
• PLIERS • VISE WRENCHES

Here at Knu-Vise you will find a most comprehensive range of standard clamping devices—clamps, pliers, vise wrenches—ready for immediate delivery. However, if your production involves a different clamping application, we'll gladly develop a special clamp to meet your needs.

Remember, all Knu-Vise clamping devices can be gripped in an instant and released just as speedily—because of their unique toggle-action.

The accompanying illustration shows only a few of the models—send for a complete catalog—just off the press.



KNU-VISE INCORPORATED

2217 Eighth St., Detroit 16, Mich.
4328 San Fernando Rd., Glendale, Cal.

Almond Drill Chuck

The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field—the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes *to fit all machine tools and portable drills.*

Write for complete details

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

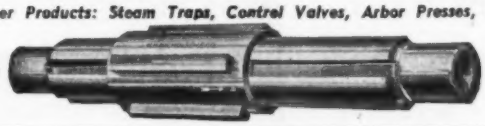
The Original Manufacturers of Drill Chucks

NICHOLSON *EXPANDING* MANDRELS PROMOTE PRECISION

And, secondly, they CUT COSTS . . . two big reasons why Nicholson Expanding Mandrels are recognized as "standard" in the nation's machine shops. Set of 19 does the work of 209 solid arbors, for all bores, ½" to 7". Two types, all sizes; singly or in sets. Prompt delivery. Bulletin 1043.

W. H. NICHOLSON & CO. • 114 OREGON STREET WILKES-BARRE, PA.

Other Products: Steam Traps, Control Valves, Arbor Presses, etc.



D&T MICROMETERS AND SNAP GAGES

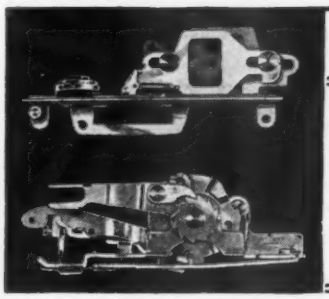
Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . . *Write for Bulletin 200* or outline your gaging problems.

• D & T Bow Micrometer 0 to 6 in. capacity

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

CONTRACT WORK



STAMPINGS and ASSEMBLIES

We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

"Greater Savings with Greist"

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS
- TURRET
- MILLERS
- SHAPERS
- GRINDERS
- LATHES
- SUPPORTING EQUIPMENT

Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.

189 Franklin Ave., NUTLEY 10, N. J.

CONTRACT WORK—

We can build machines and parts, special tools and fixtures of all kinds to your specifications and design. Skilled workmen and modern equipment are your guarantee of satisfaction. The design and building of wire and ribbon stock forming machines are our specialty.

We solicit your blueprints or samples for quotation. No obligation of course.

THE A. H. NILSON MACHINE COMPANY
Bridgeport, Conn.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

PRECISION FORM GRINDING
Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.
Send Prints for Quotation and Delivery
J. & S. TOOL CO.—477 Main St.—E. Orange 1, N.J.
(Makers of J.&S. Radii & Angle Dressing Tools)

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

WIRE AND METAL SPECIALISTS
in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

(Not available for equipment advertising)

10 cents a word minimum charge $2.00.

(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A. M. February 1st will appear in the issue of February 15th subject to limitation of space available

POSITIONS VACANT

MECHANICAL ENGINEER—Old established company now converted to pre-war production (Essential Products) has opening for mechanical engineer with some machine design factory layout and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of application. Address P-956, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL AND diemaker—experienced on automatic 4-slide machines. Permanent peacetime job. Good opportunities. Give full particulars. P-153, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER. Staff assistant on diesel engines. Must be M.E. graduate thoroughly experienced in the engineering and operational phases. Location New York City. Salary $6,000. Replies must state complete details as to age, education and experience. P-162, American Machinist, 330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

ENGINEER-EDITOR. M.E. graduate. Prefer man about 40 with some practical engineering experience. Position consists of preparing booklets dealing with lubrication of various types of machinery. Permanent position. Major oil company. Location New York City. Starting salary $5,000. Give full details as to age, education and experience. P-161, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: Die designer and estimator, draft exempt, with previous experience on all type dies. Must comply with WMC regulations. Splendid opportunity for man interested in steady employment with a progressive company, established 25 years. State age, give full details of experience and salary expected. Plant located in middle western city of 15,000. Good living conditions. P-123, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

(Continued on page 270)

WANTED

MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions in New England.

Only men 35-55 with a record of successful achievements will be considered In replying furnish information preliminary to a conveniently arranged interview.

P-140, AMERICAN MACHINIST
330 West 42 St., New York 18, N. Y.

(Additional Position Vacant ads on pages 270 & 271)

SEARCHLIGHT SECTION

WANTED
ASSISTANT TO CHIEF ENGINEER
Duties include drafting, tool and die design, plant layout. Permanent position with excellent post war opportunities.
W. M. C. Rules Apply
THE BUCKEYE ALUMINUM COMPANY
WOOSTER, OHIO

POSITIONS VACANT
(Continued from page 269)

TOOL AND die makers experienced with drawing dies for post-war position, excellent conditions; give full particulars. P-163, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL ROOM Foreman: Now successfully employed. Must have proven ability. This position offers excellent opportunity for advancement to the man having the above qualifications. Plant located in Northern Ohio. State former positions held, length of time of each, full background of experience. All replys will be held in strict confidence. Nationally known long established company. Salary. P-181, American Machinist, 330 W. 42nd St., New York 18, N. Y.

GENERAL FOREMAN Wanted. Machine tool company, a leader in its field and located in large industrial metropolitan center, seeks a man experienced and skilled in the building of machine tools; he should be a shop man with a number of years of experience in machine tool construction; state qualifications, experience, companies worked for, for whom now working, etc.; all replies will be held strictly confidential. Secure future and good income assured to the man who can qualify to run the machine tool building operations of this company. P-182, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PROJECT ENGINEER. Opportuity for man with experience in design and operation of outboard engines. Experience with small four cycle engines desirable but not essential. Should be able to perfect designs and assist in development. Give outline of experience and approximate salary expected. Correspondence confidential. Position will be made attractive to the right man. Address Wm. M. Davis, 681 Main St., Waltham 54, Mass.

PRODUCTION-MATERIAL Control supervisor. College graduate. Able to devise new methods and handle personnel problems. Metal working plant in Indiana. Give fully age, experience, references, salary expected. P-183, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL ENGINEER—Time Study, methods engineering, etc., with press and machine shop experience. Plant located in Metropolitan New York District. Products vital now and after the war with no re-conversion problem. P-184, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 35 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

PLANT OR production manager available March 1st. Fourteen years experience in design, production, methods, tooling and supervision of small precision mechanical device manufacture. High in initiative ingenuity, imagination and capable of managing and expanding small plants. Age 35. Position must afford plenty of responsibility and good postwar future. Salary not less than $10,000 acceptable. PW-165, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DIRECTOR OF Engineering-electrical—46, Chief Engineer for two of Nations major electrical war installations, chief engineer additional project. Electrical direction office and field of widely diversified installations on construction approximately 250 million valuation in 20 years. Commendable background of general engineering, of operations and extensive experience in railroad field. Western location preferred but not essential. PW-185, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINEERS AVAILABLE
A professional society wishes to announce that ten of its members are immediately available for interviews; their experience ranges from one year to four and a half years; responsibilities from senior supervisor to junior analyst in small and large machinery and assembly work, methods, processing, formula derivation, time study and administrative work; now located in Ohio. Address
PW-175, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

POSITIONS WANTED

TOOL SUPERVISOR available, will cut costs, solve manufacturing difficulties. Simple, effective tools. PW-129, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WORKS MANAGER plant or factory manager. American, 49 years. Wide and varied experience in air craft, automotive, machine tools, machine and die making, general jobbing. Held positions as plant and factory manager, general superintendent; master mechanic, tool superintendent, strong and rapid increase in production. Practical tool and diemaker, technical education. Thoroughly versed on handling organized labor, grievances and negotiated contracts. Last two positions have tripled gross output. Am now employed. Right connection more desirable than salary. PW-186, American Machinist, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER available from motor city. Wishes position with progressive concern. Extensive experience as master mechanic, chief inspector, production superintendent, process engineer, plant layout, tool design and tool making. Prefer Mid-Wester location. PW-187, Amer. Mach., 520 N. Mich. Ave., Chicago 11.

SALESMAN WANTED

MACHINE TOOL Salesman. Must have experience in sales and engineering of small and perishable tools, salary and commission. Location eastern territory. SW-188, American Machinist, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITIES

PATENT FOR Sale Car Heater—the most simple, efficient, and inexpensive to manufacture. Further details write V. Turdin Hope Hill Road, Wallingford, Conn.

PUT YOUR Patents to work. Responsible firm of 22 years experience in patents and licensing, desires items for development. Prefers ideas adaptable licensing exclusive basis. Will buy outright or take exclusive franchise. Can develop special machinery if necessary. Submit patent or drawings. Explain prospects, competitive products and basis will do business. BO-189, Amer. Mach., 520 N. Mich. Ave., Chicago 11.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

SALES ENGINEER WANTED
Well established machine tool distributor with exclusive contracts handling the finest quality and best nationally known machine tool builders needs high-class sales engineer to contact purchasing and engineering departments of large New York corporations in metropolitan area. Above the average salary, expenses and incentive arrangement. Above draft age preferred. Must have pleasing personality and some knowledge of machine tools and engineering. Must have selling experience although previous machine tool selling experience not necessary. Write complete details of past business experience.
SW-192, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

MECHANICAL ENGINEERS WHO WANT TO SELL
If you've ever wanted to capitalize on your engineering training in the lucrative field of selling industrial machinery, here is your opportunity. Progressive management has made this 36-year old company the leader in its field. Now engaged in war production. Unusual postwar opportunities. Men selected will be given complete training. Prefer graduate M. E's. under 40. Write
SW-177, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

SALES OFFICE AND PERSONNEL AVAILABLE
Desires connection with well established company whose product must be handled by technically trained men. Office located in industrial center of Michigan. Will cover all middle west states if necessary.
SA-179, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Illinois

DO YOU NEED THIS FIELD SALES ENGINEER?
Here is a trained sales engineer (M.I.T.) who is interested in contacting a good company which wants high-calibre representation.
He has a sound record of successfully selling machine tools and other mechanical products requiring engineering in their applications.
He is well acquainted in these areas: New England, New York, Chicago and Detroit.
If you have, or anticipate having, a field sales engineer or branch manager's position open . . . write
SA-169, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED TO BUY
Principals, long established and experienced in machine shop business are interested in buying for cash any established manufacturing business.
We prefer such opportunities where, after sale, personnel will remain and where the present owner will continue to supervise production at an attractive salary. We would furnish overall management, supply orders, new equipment, capital etc.
Send brief description of Product and activity with first letter.
Area within 30 miles of Newark, N. J., preferred.
BO-176, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

PRODUCT WANTED
For Post-war manufacturing. Organization with complete Engineering Department, tool making, and manufacturing facilities. Modern plant, in position to develop, manufacture, advertise and sell. Royalty basis or any other satisfactory arrangement.
BO-174, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

FOR SALE
Prosperous corporation manufacturing machine shop accessories. Purchasers may take over management if desired. Present management will stay if a few stock holders who want to sell are bought out. Present management has new "sure-fire" products and real distributor contacts. A successful company for 86 years doing business through mill supply and hardware trade. 40,000 square feet, 18 acres land abutting rail lines. Foundry, machine shop, administration building, etc. Equipment in good condition. Reply to
BO-146, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FOR SALE
Complete precision machine shop, located near New York City; doing an annual volume of $450,000, employing 60 people on close tolerance manufacturing. $200,000 back log of orders. Will sell only as an operating plant; not for liquidation. Real estate included. Present management burdened with too much responsibility, having other business enterprises. Full particulars upon request.
BO-156, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

MECHANICAL ENGINEER

For Phila. Concern with following duties:

1. Assume charge of small drafting room.
2. Supervise and assist in preparation of shop detail drawings of heavy machinery and special gear reduction units.
3. Extend engineering assistance to shop when required.

Position now held by one man continuously for 28 years retiring on account of age. Definitely a post-war opportunity.

P-170, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITION AVAILABLE

ENGINEER OR TOOL DESIGNER

Experienced in tool design, and production processes and equipment. Permanent. Applicant must have good practical or technical background. State details of education and experience, draft status, age and availability. Send photo with application and state salary expected. Address your reply to:

A. B. CHANCE COMPANY
210 N. Allen St. Centralia, Missouri

WANTED

MECHANICAL ENGINEER

In light metal stamping and screw machine work.

ALSO

EXPERIENCED DRAFTSMAN

Good opportunity in old established company. Give full particulars as to experience and salary desired.

P-190, American Machinist
520 North Michigan Avenue
CHICAGO 11, ILLINOIS

POSITION VACANT

Exceptional opportunity for right man. Large machine tool distributor in Chicago District needs experienced machine tool correspondent. Write giving full particulars, experience, age, etc.

P-173, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Illinois

PERMANENT EMPLOYMENT

MECHANICAL ENGINEER

Leading eastern control and instrument manufacturer requires experienced M. E. responsible for all mechanical design. Immediate and post-war opportunity.

P-171, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

ASSISTANT SUPERINTENDENT

Manufacturing

Well established medium sized Chicago firm, for years a leader in design, manufacture and sale of products applied to electric power installation, offers an excellent opportunity for permanent employment.

Qualifications—

About 32 to 38 years of age.
Educational training equivalent to University course in Administrative-Mechanical Engineering.
Representative experience in Metal Trades Manufacturing work.
Ability to select, train and supervise all types of manufacturing employees.
Initiative, judgment, resourcefulness and tact in handling problems associated with the manufacture of diversified lines of products.

Our products are now being furnished to war activities and will be in greater demand in peace time.

It is not our intent to bring a person into our employ while he is an essential employee of some other necessary war industry.

All correspondence will be considered strictly confidential.

P-178, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

Opportunity of a Lifetime for

DESIGNING ENGINEER

The bag division of the Savannah plant of Union Bag & Paper Corporation desires immediate services of Designing Engineer. Prefer engineer with experience in the manufacture of paper bags, but every consideration will be given applicants with mechanical design experience. Position is permanent, and salary is commensurate with ability. In applying please give full particulars as to experience, education, draft status, salary expected and other pertinent data. Applicants must conform to regulations of War Manpower Commission. Address all communications to Manager, Industrial-Relations Division.

UNION BAG & PAPER CORPORATION
SAVANNAH, GEORGIA

TOOL OR DIE DESIGNERS

Ohio Manufacturer with Die-Cast Division, needs Tool or Die Designers to design Die-Cast Dies, Tools, Jigs, and Fixtures. Broad experience with Machine Tools essential. Some mechanical and hydraulic engineering experience advantageous. Living conditions good in small town, or near-by medium sized city. Excellent post-war opportunities. W.M.C. Rules apply.

P-997, AMERICAN MACHINIST
520 North Michigan Avenue
CHICAGO 11, ILLINOIS

WANTED

Mechanical Engineer

Experience on design of presses, press feeds, hoppers, etc.

Tool Designer

Experienced on Jigs & Fixtures or plastic mold design.

Above positions in *Powder Metallurgy* field with old established company in New Jersey. Excellent Post War future. Write full details in first letter including salary desired.

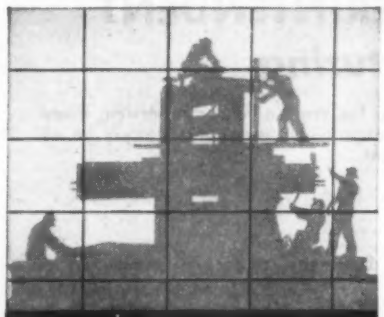
P-180, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

METAL SPECIALIST

Situation Open — Thorough knowledge metals, broad experience in metal manufacturing and finishing processes. Sales-minded to assist sales and service organization on problems arising in field. Our products extremely essential in all kinds of production, processing and maintenance work. Location N.Y.C. Willing to travel. Give details, experience, age, etc.

P-168, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.



ENGINEERED-REBUILT
THE SIMMONS WAY

Every machine listed in this column is in our warehouse at press time.

●

2¼" Bar LUCAS Horizontal Table Type Boring Mill, M.D.
2½" Bar CLEVELAND Horizontal Table type Boring Mill, M.D.
5" Bar DETRICK-HARVEY Floor Type Horizontal Boring Mill, M.D.
42" BULLARD, NEW ERA, 1100 serial
42" N-B-P Car Wheel Borer, M.D.
66" N-B-P Vertical Tire Mill
4' HAMMOND Sensitive Radial Drill
6' CARLTON Motor-on-Arm, Plain
7' CARLTON Motor-on-Arm, Plain
8' N-B-P Motor-on-Arm, Plain
#16 BLANCHARD Surface Grinder
33"x9" G & E Spur Gear Cutter
27" BRIDGEFORD Axle Turning Lathe
29" PUTNAM Axle Turning Lathe
42" PUTNAM Car Wheel Lathe
36"x18' N-B-P "TIME SAVER" Lathe
#2 CLEVELAND Plain Miller, M. D.
#3-B MILWAUKEE Plain Miller, M. D.
#4 B & S Universal Miller, M. D.
#5 B & S Plain Miller, M. D.
#6 BECKER Vertical Miller, M. D.
#10 N-B-P Heavy Vertical Miller
24"x24"x12' INGERSOLL Plain Miller
24"x36"x12' INGERSOLL Side Miller
30"x36"x12' INGERSOLL Planer Miller
30"x30"x10' NEWTON Slab Miller
24"x24"x 6' WHITCOMB Planer, one rail head, 230 volt D.C.
30"x30"x12' N-B-P Planer, Two Rail Heads, 230 volt D.C.
36"x36"x10' WOODWARD-POWELL Planer, 4-Heads
48"x48"x24' N-B-P Planer, 3-heads, M.D.
60"x48"x12' CINCINNATI Planer, 3-heads
72"x72"x18' N-B-P Heavy Planer, 4-heads 230 volt, D.C.
RT-40 SCHULTZ-NAUMANN Beam Shear
5" Capacity U.E.F. Alligator Shear
72" 105 Tons L & A Multiple Punch
6"x6"x⅝" Double Angle Shear
12" SELLERS Crank Slotter
20" SELLERS Crank Slotter
2" LANDIS Pipe Threader
6" BIGNAL-KEELER Pipe Threader

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany, N. Y.
N. Y. Office: 50 East 42nd St.

CLOSEOUTS

BORING MILLS
HORIZONTAL
2½", Universal; 2½"-4" Binsee
4" Landis Horiz. Floor Type, M.D.

VERTICAL
66", 120" Niles
42" Bullard, M.D., 54" Colburn M.D., 2 hds.

TURRET LATHES
Nos. 2A, 3A W. & S., 4⅛" hole, M.D.
24" Gisholt, 6⅛" hole
Foster Nos. 4, 5, 6, 1B, M.D.
W. & S. No. 4 Univ., M.D.
J. & L. 2¼x24", 3¼x36"
Acme 3¼x36" grd head

GRINDERS
P. & W. 14", 18" B.B. Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12"x18", M.D.
Heald Nos. 55, 70, 72A8 Gagematic, M.D.
Norton 50"x28", M.D.
Gardner 72" disc, M.D.
Landis 6x20", Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
B. & S. No. 3 Univ.
B. & S. No. 11, S.P.D.
12" Heald Rotary, M.D.

LATHES
48"x12' Harrington Sld. Bed
McCabe 26-42"x14'
26"x24' Putnam 2 step cone, D.B.G.
24"x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16"x8' Lodge & Shipley Grd. Hd., taper, M.D.
14"x6' Hendey, taper, collets
9' LeBlond Automatic
36"x30' Putnam, M.D.
36"x20' Putnam S.C.G., D.C. M.D.
36"x30' LeBlond, M.D.; 32"x35' Wickes M.D.
Putnam 42"x16' M.D.
30"x26' L. & S. 12 speed, M.D.

AUTOMATICS
New Britain 1⅝"x7" 6 spindle, Timken Bearings
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B, 1", 2"
Cleveland ⅞", Model M, 4 spindle
Gridley 4¼" single spindle, M.D.
P. & J. 6A, M.D.

GEAR CUTTERS
Nos. 3, 12 Barber-Colman Gear Hobber
No. 6 Fellows Gear Shapers
B. & S. Nos. 3-26", 4-36"
Gleason 11" Bevel
Pfauter No. O, M.D.

SHAPERS
16" Rockford Hydraulic M.D.
20", 24", G. & E.
16" Ohio, M.D.
16", 20", 26" Stockbridge

RADIALS
4', 7', 8' American Triple Purpose
5' Dreses Full Universal
3', 3½' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES
Ingersoll Planer type 36"x36"x12', 4 hds. M.D.
No. 20 Van Norman; 10" P. & W. Auto
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5, B. & S. Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4 Cincinnati Vert.
P. & W. No. 12 Profiler, M.D.
No. 4 B. & S. Universal
Rowbottom Cam Miller
K. & T., B. & S. No. 3, Dbl. overarm, Timken Bearings

MISCELLANEOUS
10'x¾" Geo. Ohl Shear, M.D.
Gorton No. 1S, 3S Engraving Machines
6 spindle Avey Drill, 15' overhang
800 ton coining press; McCabe ½" Flanger
Rochester No. 5B Hammer
Pels 6' Throat Punch; Pottstown Tappers
P. & W. 6" Vert. Shaper
Marvel Metal Band Saw No. 8 M.D.
Pipe Machines, 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
No. 30 Natco Multiple Spindle Drill
150 ton United Steam Hammer

AARON MACHINERY CO.
MONA MEMBER
45 Crosby St.
New York 12, N. Y.

MILES QUALITY TOOLS

AUTOMATICS
No. 0 Brown & Sharpe
1¾" Gridley 4-spindle
4½" Gridley 4-spindle chucking, Model H
No. 454 New Britain, 4-spindle chucking
7" Baird 6-spindle chucking
14"x19" Fay automatic lathe

COMPRESSORS
92' 7"x8" Ingersoll Rand
427' Chicago tandem steam driven
550' National 3-cylinder vertical with motor
1400' Sullivan 2-stage with motor

DRILLS
Sensitive, all makes and types
20", 21" & 24" Cincinnati upright
23" Weigel, BG, PF, tapping att.
3' Western radial, motor driven
3½' American radial
4' Western radial, Timken bearing, MD.

GEAR CUTTERS
Nos. 7 & Z1 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & S spur gear cutter
11" Gleason straight bevel, segments & gears
15" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cincinnati "Peerless" gear chamferers
Lips 2-spindle gear chamferer

GRINDERS
No. 1 G Gronby internal
No. 75 Heald internal
Heald No. 72 automatic electric sizing internal
12"x36", 18"x36" and 18"x82" Landis
10"x36" Norton
8"x24" No. 1 Brown & Sharpe universal
6"x20" No. 10 Brown & Sharpe
20" Gardner semi-automatic disc grinder
6"x22" No. 78 Wilmarth & Morman surface
12"x24" No. 1 Diamond surface grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x48" Landis crankpin grinder
No. 60 Heald & No. 0 Landis cylinder grinders

FORGING EQUIPMENT
No. 2B Nazel air hammer, motor driven
400 Chambersburg board drop hammer
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

TURRET LATHES
36" Bullard vertical (spiral geared), new 1943
28" No. 3B Foster, 5¼" spindle hole
20" Libby 7½" hole.
26" Libby 4½" hole; taper attmt.
22" Libby 4½" hole, taper attmt.

MILLERS & BORING MILLS
2½" & 3" Universal boring mills
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
Nos. 2 & 3 Kempsmith plain
Nos. ½ & 2 Van Norman plain
No. 3 Cincinnati universal
No. 12 Brown & Sharpe Mfg. elec. drive
48" Cincinnati automatic, bed type
No. 3 Sundstrand bed type mfg miller
48" Oesterlein tilted offset miller
Type C Hall planetary thread miller
Nos. 4 & 6 Lees Bradner univ. thread
42" Ingersoll continuous rotary
4" Rice Barton double spline

MISCELLANEOUS
No. 6 Waterbury Farrel openback press
6" Bignall-Keeler pipe threader
2" Landis pipe machine
3" Acme bolt threader, Landis head
6"x6" Hilles-Jones angle shear & Turn table
No. 7 Greenerd arbor press, practically new
Arcade jar molding machine
Cleveland sand cutter
4" Stevens die slotter, New 1941

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICHIGAN

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

● ● ● OUR INVESTMENT IS YOUR SECURITY
● ● ● SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK*

SHEARS

Lennox Splitting Shear, 8' throat, ¾" cap., arr. M.
Lennox Bevel Shear, ¾" cap., arr. M.D.
Dreis & Krump Apron Brake, 10' x 10 ga., #204, motor driven.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss D.C. B.G. Forging 4" stroke (2).
#4½ Bliss 3 column B.G. 3" stroke.
#5 Bliss D.C. B.G. Forging 3" stroke.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Vertical, 48" Gisholt.
Hill 4" Bar Horizontal Table Type.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
54" Colburn Vertical Boring Mill.
No. 31 Lucas Horizontal Boring Mills 3".

DRILLING MACHINES

Cincinnati-Bickford 24", 4 spindle, #4 M.T. Table 20" x 67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Leland Gifford 2 spindle.
Woodward & Rogers 6 spindle.

RADIAL DRILLS

3' Dreses, 9" Rd. Column.
3' Arm 9" Col. Cincinnati Bickford
4' Arm 11" Col. Cincinnati Bickford
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford

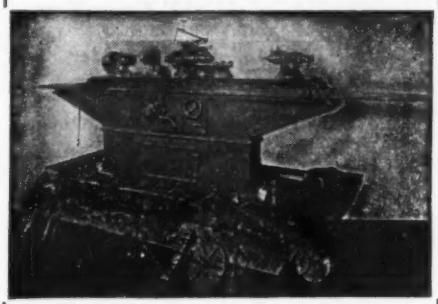
MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Natco #D-5, 10 spindles #1 M.T.

GRINDERS

16" Heald Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
12" Heald Rotary Surface Grinder equip. with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump.
Oliver Model 51 Drill Grinder; 1½" cap.
Pratt & Whitney 14x36 model B vertical surface grinder.
#2 Brown & Sharpe Surface Grinder.

Brown & Sharpe No. 4 Univ. Cylindrical Grinder. M.D., with regular equipment.



Capacity:—Centers swing 12" dia.; over water guards 10¾". Distance between centers 60". Takes wheels to 12" dia.x1½" to 1" thick. Longitudinal Table travel — 10 changes in rate; range 1½" to 53" per minute. Work speed—6 changes for live or dead center grinding. B & S No. 9 taper hole.

MILLING MACHINES

#4 & #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2).
#1 Kempsmith Universal, Cone Drive.
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
Ames Precision Universal Bench Mill.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller
No. 1B Hendey Universal, cone drive.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x36" N.-B.-P., Planer Shaper, M.D.

LATHES

Putnam 26 x 12 Heavy QCG, arr. for M.D
American, 16 x 6 Q.C.G., Geared Head
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
LeBlond 14 x 6 Q.C.G.
Seneca Falls Tool Room 14 x 6, Q.C.G.
20 x 10 Lodge & Shipley, G.H., M.D., Taper Att. (2).

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
#61-2 Fellows 36" Gear Shapers (2).
12" Schuchart & Schutte Gear Hobber
#1 Adams Gear Hobbers, Belt driven (3).

BENDING ROLLS

Bertsch 3" x 3" x ⅜" angle bending roll.
Niagara pinch type 7' x 7" roll motor driven.

SLOTTERS

Betts 36" Geared Slotter, Motor driven, 54" dia. Rotary table.

MISCELLANEOUS

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer. portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face, 20" diameter.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72" cap. 14 ga. arranged M.D.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

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Machinery Merchants

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17"x124" centers LeBlond Rapid Production, m.d. in base, latest
11"x28" centers Reed Speed Lathe
15"x36" centers Polishing Lathe
3½x36" centers LoSwing, s.p.d.
3x80" LoSwing, m.d.
8x84" LoSwing, m.d.
9x12" Sundstrand Mfg., s.p.d.
13x24" Coulter Auto. Threading Lathe, m.d.
13x72" Automatic Threading Lathe, m.d.
13x96" centers Automatic Threading, m.d.
15"x6' Automatic Threading, belt
20"x8' LeBlond Mfg. Type, m.d.
20"x16' American Geared Head, arranged for spindle boring
Niles-Bement-Pond Axle Lathe, m.d.
Niles-Bement-Pond Axle Lathe, belt
42x96" Niles-Bement-Pond Car Wheel Lathe, m.d., new
42x96" NilesBement-Pond Car Wheel Lathe, m.d., used
Niles-Bement-Pond Quartering Machine, m.d., new

HORIZONTAL MILLING MACHINES

No. 3B Brown & Sharpe Plain, m.d.
No. 3 Cincinnati Plain, rect. overarm
No. 3B Milwaukee Plain, double overarm
No. 4 Cincinnati Universal, m.d.
No. 4 Cincinnati Plain, m.d.
No. 5B Heavy Brown & Sharpe Plain, m.d.
No. 3 Garvin Hand, m.d.

MANUFACTURING MILLING MACHINES

No. 0-8 Cincinnati Plain Automatic, m.d.
Hall Planetary Thread, Model D, m.d.
No. 1-8 Kent-Owens Hydraulic, m.d., latest
18" Cincinnati Plain Auto., m.d.
28" Cincinnati Plain Auto., m.d.
No. 4-36 Cincinnati Plain Hydromatic, m.d. in base, latest
No. 34-36 Cincinnati Plain Hydromatic, m.d. in base, latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d. in base, latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d. in base, with tracer control, latest
4½x12" Pratt & Whitney Thread, belt
6x14" Pratt & Whitney Thread, belt
6x29" Pratt & Whitney Type B thread, m.d.
6x48" Pratt & Whitney Thread, m.d.
6x80 Pratt & Whitney Thread, m.d.
36"x36x14' Bement Slab, m.d.
54"x54"x10' Liberty Planer Type, var. speed m.d.
No. 2, 12 Pratt & Whitney Lincoln Type, belt
Burr Mfg., m.d.

VERTICAL MILLING MACHINES

No. 2 Brown & Sharpe, m.d.
No. 3 Cincinnati, m.d.
No. 3B Milwaukee, m.d. in base
No. 3V Toledo, s.p.d.
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 6 Becker, cone
2 spindle Newton, m.d.

PLANERS

24"x24"x5' G. A. Gray, 1 head, m.d.
24"x24"x6' Pond, 1 head, belt
30"x30"x10' American, 1 head, belt
30"x30"x10' American, 2 heads, belt
30"x30"x14' G. A. Gray, 2 heads, belt
36"x36"x10' Niles, 2 heads, belt
36"x36"x12' Powell, 2 heads, m.d.
36"x36"x12' Woodward & Powell, 2 rail, 1 side head, m.d.
36"x36"x18' Niles-Bement-Pond, 2 heads, var. speed m.d.
36"x36"x20' G. A. Gray, 2 heads, belt
36"x36"x20' Cincinnati, 2 heads, m.d.
36" widened to 44"x36"x20' G. A. Gray, 2 heads, revers. m.d.
42"x42"x20' Cincinnati Hypro, 2 rail, 2 side heads, reversing m.d.
42"x42"x26' G. A. Gray, 2 heads, m.d.
48"x48"x30' Cincinnati, 2 rail, 2 side heads, m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
50"x48"x32' Niles-Bement-Pond, 2 rail, 2 side heads, reversing m.d.
60"x60"x16' Niles-Bement-Pond, 2 rail, 2 side heads, reversing m.d.
60"x60"x20' Cincinnati, 2 rail, 2 side heads, m.d., p.r.t.
60"x60"x20' G. A. Gray, 2 rail, 2 side heads, m.d.
60"x60"x40' Niles-Bement-Pond, 2 rail, 2 side heads, reversing m.d., p.r.t.
72"x72"x24' Niles-Bement-Pond, 2 rail, 2 side heads, m.d.
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More than 1,000 machines in stock for immediate shipment. Send us your inquiries.

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MOREY
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BULLARD 24" Vert. Turret Lathe—with side head; R.P.
LANDIS 20"x220 Plain Cyl. Grinder—M.D.
GLEASON 3", 6", 11" Bevel Gear Generators—2 tool type
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SLEEPER & HARTLEY Coil Winder
CINCINNATI Gear Burnisher

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72" x 56" x 16' Gray 4 heads. M.D.

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1—#12-24 Milwaukee Simplex, M. D. 220/440—3—60 Pump piping, Oil Filter, arbor
3—M-18 Milwaukee Simplex, M. D. 220/440 Pump and Piping
2—#1-18 Cincinnati Automatics, M. D. 220/440, Climb Milling Arbors
3—#08 Cincinnati Verticals 220/440 motors
1—18" Cincinnati Mfg. Milling, 220/440 motor, Pump Tank & Arbor
2—#10 B & S Production Built in M. D. Push Button Control
1—#4B Heavy B & S Pl. Horizontal, S. P. Drive, E Geared Coolant
1—#21 B & S Production, S. P. Drive
1—24" Cincinnati Semi Automatic, Arr. Motor Drive
1—#2 M. S. Cincinnati Vert. Dial Type, M. D. 1941

GRINDERS

2—10"x48" Landis Type C Hydraulic Cylindrical 220/440, 3 Ph.
1—#10 B & S Plain Cylindrical, M. D.
2—12" Pearson Arter Rotaryy Surface, Generator, Extra Chucks, M. D.

MISCELLANEOUS

2—Avey—4 Spindle Drill, Equal New, M. D.
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1—6R Cincinnati-Acme Chucking 6 Sta. M. D. Like New
1—#46"x12" Bement-Niles Engine Lathe Compound, Sty. Rest.
1—#401 Campbell Cut Off, Like New, M. D.
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1—4' American Radial Drill, Box Table, M. D. ⅞"-1¼"-1½"-2¼" Cone Automatics, 4 Sp., M. D.
1—2⅝" Gridley, 4 Sp., M. D.

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UNUSUAL VALUES

Brake, Robinson 5' toggle
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Grinder, 10' Bridgeport, Knife
Lathe, 20"x10' L & S. Grd. Hd.
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Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
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Excellent condition!
5' American Plain Radial Drill
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3⅞" Niles Bement Pond horizontal Boring Bar
ALL MOTOR DRIVEN
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CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

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10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x120	16x30	18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

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1—56"x56"x18" Cinci. Dbl. Housing Planer with 3 hds. D.C. vari. speed m.d.
1—6' Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.
1—12"x18" Cinci. Rebuilt Plunge Cut Grinder, 18"x9" face wheel, A.C. m.d.

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18" Gleason Bevel Gear Generator
60" Bickford Vertical Boring Mill
#81 Heald Gagematic Grinder, M.D.
2—#4½ Bliss Presses, M.D. less than 2 years old
3—#11 B & S Grinders
2—16" Bullard 8 spdl Mult-au-matic, year old
#33 Kempsmith Production Mill motorized
8x48 Pratt & Whitney O.D. Grinder

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100" BORING MILL

2 Swivel Heads on Rail, Motor Drive, Power Rapid Traverse.

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1—5' American triple purpose plain radial drill, motor on arm.
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60" Gisholt Vertical Boring & Turning Mill.
60" Betts Vertical Boring & Turning Mill.
5' American Triple Purpose Pl. Rad. Drill.
6' American Triple Purpose Pl. Rad. Drill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
#4 Cincinnati High Power Plain Miller, PRT.
#4 Cincinnati High Power Vert. Miller, PRT.
#3 Brown & Sharpe Vertical Miller, S.P.D.

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12" x 96" Landis Plain, S.C.
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18" Gleason Bevel Gear Generators.
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#2 Schuchart & Schutte Gear Hobber.

PLANERS

42" x 42" x 20' Cinn. Hypro, 4 Hds. D.C. drill.

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Kaufman Model 10A Tapper, M. D.
No. 5 Cincinnati Plain Mill, S.P.D.
Gridley Model H 4-spindle Chucking Machines, M. D.
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AUTOMATICS, Gridley, 9/16, ⅝ & 1¼" Mod. G.
AUTOMATICS, Cone, 1¼ & 1½" 4 spindle
AUTOMATICS, Gridley, ¾, 1¼, 1¾ & 2¼" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 4¼" S. S.
AUTOMATICS, Cleveland, 1¼, 1½ & 2¾" Mod. A
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland ⅞, 1¼ & 1½" Mod. M
AUTOMATICS, Cleveland 3½" Model K4—M.D.
AUTOMATICS, New Britain #22 & 24 Chuckers
AUTOMATICS, New Britain 1⅝"x7" 6 spindle.
AUTOMATICS, New Britain 2⅝" 6 spdle., M.D.
AUTOMATICS, Potter & Johnston #5a & 6A
BORING MILLS, 24 & 42" Bullard, M.D.
BORING MILLS, Rockford, 3⅛" bar, Horizontal, 24x72" table, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6.
GRINDER, Brown & Sharpe #2 Universal M.D.
GRINDERS, Cincinnati 12" x 18" Plunge Cut
GRINDERS, Bryant #3 Internal, M.D.
GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D., 9x31" Magnetic Chuck
GRINDERS, P-Arter 12" Rotary surface, M.D.
LATHES, American 14"x6' & 20"x8', M.D.
LATHES, Warner & Swasey, #2, 4, & 6, M.D.
MILLING MACHINES, #29 Ohio Universal, M.D.
MILLING MACHINES, #2B Rockford Universal, M.D.
MILLING MACHINES, Becker Vertical #5 & 6
MILLS, Briggs Production Type A&B
PLANER, Ohio 42" x 42" x 12' One Head, M.D.
PLANER, Gray 30" x 30" x 8', 2-Rail Heads

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Consamatics—1½" Cap.
B & S #00, #0 & #2
Cleveland 2¾" A—M.D.
Gridley 2¼" 1 sp.
Potter & Johnston #6C Chuckers
Geo. & Delcuvw Chucker
Gridley 1¼" Model F

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Universal 3½" Bar Horiz.
Bullard 36" Rapid Production
Bertram 42" Vertical
Bullard 100"—2 Head—M.D.

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Reed-Prentice 3'
Niles 7' Radial
Cincinnati-Bickford 6' Radial
Pratt & Whitney Gun Barrel Drills & Rifters

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Brown & Sharpe #3—26"
Fellows #64
Fellows Gear Burnisher
Gleason 6" Generator
Detroit Gear Grinders

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Norton 6x32, 10x24, 18x96
Baxter D. Whitney #36 Cylinder Grinder. Like New
Brown & Sharpe #11 Plain
Heald #70-A Internal
Cincinnati Centerless Lapper
Heald #72-A-3 Sizematic. New 1940.
Norton 15"x15"x72" Surface
Say-Way Internal
Brown & Sharpe #3 Univ.
Bath 10"x28" Univ.
Cincinnati 12"x36" Univ.
Landis 20"x120", 20"x144" Plain Grinders
Cincinnati #1½ Tool & Cutter
Norton #2 Tool & Cutter
Pfauter Hob Grinder
Bryant #3B, 8, 12, 18 Internal
P & W 14" B.B. Vert. Surface
Farrel Roll Grinder
Badger #8 Disc Grinder, M.D.

LATHES:

Sidney 17"x8'
Lodge & Shipley 24"x10' ga.
Johnson 30"x24'
McCabe 33"x55"x16½'—Two in One

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Milw. #3B Plain Double Overarm
Rockford #3 Univ.
Brown & Sharpe #1½ Universal
Brown & Sharpe #10, new 1940
Rice-Barton Spline Millers
Milwaukee #1½B Vertical
Becker #4B Vertical
Cincinnati #3, #4 Vertical SPD
B&S #3 Vertical SPD
Hanson-Whitney Thread Miller
Waltham Bench Thread Miller
Rowbottom Cam Miller
P & W 5", 12" Automatic
Pratt & Whitney 2" Spline Duplex
Pratt & Whitney 4½"x12"
Cincinnati 12" B.G. Mfg. Becker #7H Lincoln

MISCELLANEOUS

Boring Machine—Coulter Diamond Borer
Chamfering Machine—Pratt & Whitney
Chucking Machines—Potter & Johnson #6-C
Hammer—Bliss 300 Lb. Drop
Header—W-F ⅝" Ball
Header—W-F #1—6SSD
Shaper—P & W 6" Vertical
Shear—Marshalltown #88 Rotary Bevel, M.D.
Tapper—Threadnut #2
Upsetter—Acme 2" Steel

PLANERS:

Cincinnati 36"x36"x20'
Cincinnati 48"x48"x20', 3 Head
Gray 84"x72"18', 4 Head

PRESSES:

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W-F 20 Ton Rack & Pinion
Bliss #1 Double Action Toggle
Robertson 170 Ton Hyd. 16' High

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FEED FINGERS PADS

ACME No. 515, No. 52, No. 53, No. 54, No. 55, No. 56.

ACME-GRIDLEY 1⅝".

Cleveland ⅞" to 2½".

Cone 1¼", 1½", 2½".

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Gridley, Models F, ¾", ⅞", 1¼", 1⅜", 2¼", 2⅝", 3¼", 4¼".

Special Master Collets and Master Feed-fingers for 4" Cone.

Large Stock 1⅜" F. Gridley Collets.

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Bardons & Oliver, Brown & Sharpe, Davenport, Garvin, and New Britain.

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Form & Lead & Cut-off Cams for ⅞" G. Gridley

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CHICAGO (21), U. S. A.

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1—No. 4B Heavy Duty Brown & Sharpe Plain Mill, S.P.D.

54"Gisholt Vertical Boring Mill, 2 heads on rail, M.D. with motor.

1—56"x20' New Haven Lathe

Cook County Machinery Co.

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1—used Watson Stillman 400 ton single opening hydraulic press, 16" dia., by 21" stroke downward acting ram, 48" daylight opening, 31" bottom bolster, 34" x 34" plates, clear space left to right between uprights 30¼". HIGHEST PRICES PAID FOR YOUR SURPLUS EQUIPMENT.

Universal Hydraulic Machinery Company
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WAlker 5-5332-3

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Newton Vertical Miller with 42" Rotary Table. New Condition. Never Used.

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FOR SALE

One 35,000 pound air or steam drop hammer and 300 ton Bliss Trimming Press, 12 inch stroke, practically new.

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Model HDLL 1836-9 Lithcarb Atmosphere Furnace 5' 6" wide 11' 7" long. Temperature Range 1200° F. Minimum to 1800° F. Max. Capacity for Neutral Hardening—135 lbs. per hr. complete with controls and instrument panel and blower—1 year old—actual use—6 mos.

Price $6550.00—F.O.B. Meadville, Pa. our Plant.

Model Pld. #2836 Lithdraw Furnace, Pit Type Normalizing furnace. 89" dia. x 65" high.—Heated area — 28" x 36" — Temp. Range 800° F. Min. to 1700° Max.

Complete with Controls, instrument panel and blower 1 year old—Actual use—6 mos. Price $8,000.00—F.O.B. Meadville, Pa. Our Plant. Condition—Like New.

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PUMP

1 Spiegel F.S. 5 Motor Driven Portable Coolant Pump. Practically New.

W. W. FRENCH
2074 STOWE ST. UNION, N. J.

FOR SALE

#4-C-8132 MARQUETTE PRESS

650 ton pressure, 20" stroke, 4 crank, air equipped, 89"x132" bed, 134" between the uprights.

ADELPHIA EQUIPMENT COMPANY
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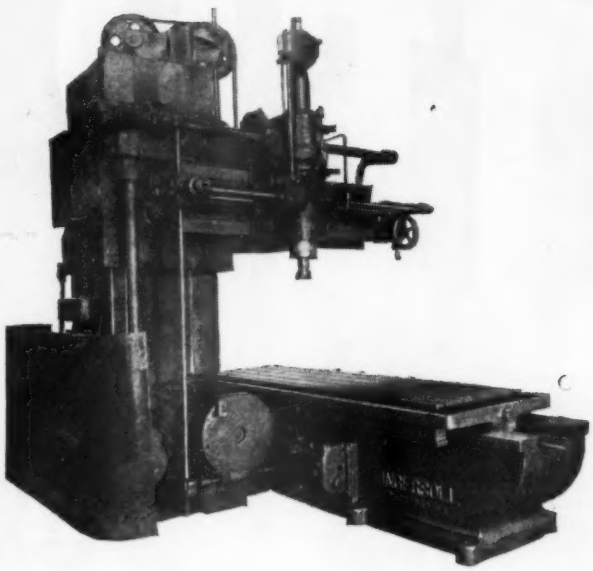
INGERSOLL OPEN SIDE VERTICAL MILLER



30"x48"x96" INGERSOLL OPEN SIDE VERTICAL MILLING MACHINE

Table working surface 29" x 96".
Spindle vertical feed 24".
Table travel 96".
Maximum distance spindle to column 44".
Adjustable rail.
Power rapid traverse.
Arranged for motor drive.
Weight about 24,000 lbs.

IMMEDIATE DELIVERY

This machine is available for inspection at any time.

Wire — Write — Phone

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Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. **New York City**

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